INSTALLATION RESTORATION PROGRAM

FINAL

SITE INVESTIGATION REPORT
Site 7, POL Area
171st Air Refueling Wing

Pittsburgh International Airport
Pennsylvania Air National Guard
Coraopolis, Pennsylvania

SEPTEMBER 1996

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
Environmental Restoration and Waste Management Programs
Oak Ridge, Tennessee 37831-7606
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for the U.S. DEPARTMENT OF ENERGY under contract DE-AC05-84OR21400

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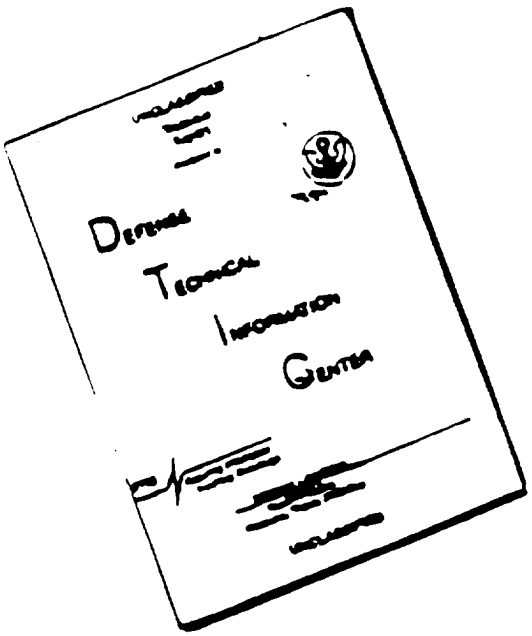

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FINAL

INSTALLATION RESTORATION PROGRAM

SITE INVESTIGATION REPORT
SITE 7, POL AREA
171st AIR REFUELING WING

PITTSBURGH INTERNATIONAL AIRPORT
PENNSYLVANIA AIR NATIONAL GUARD
CORAOPOLIS, PENNSYLVANIA

Submitted to:

AIR NATIONAL GUARD READINESS CENTER
ANDREWS AFB, MARYLAND

Submitted by:

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
Oak Ridge, Tennessee 37831

for the:

U. S. DEPARTMENT OF ENERGY

Prepared by:

EARTH TECH, Inc.
Oak Ridge, Tennessee 37830

SEPTEMBER 1996

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ACRONYMS AND ABBREVIATIONS

FINAL SITE INVESTIGATION REPORT
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CORAOPOLIS, PENNSYLVANIA

ABB-ES	ABB-Environmental Services, Inc.
AMSL	above mean sea level
ANG	Air National Guard
ARAR	applicable or relevant and appropriate requirement
ARW	Air Refueling Wing
AST	Aboveground Storage Tank
ASTM	American Society of Testing and Materials
At	Atkins Silt Loam
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
1,2-DCA	1,2-Dichloroethane
t-1,2-DCE	trans-1,2-Dichloroethene
DI	Deionized
DD	Decision Document
DOD	Department of Defense
EARTH TECH	The Earth Technology Corporation
EE/CA	Engineering Evaluations/Cost Analyses
EPA	U.S. Environmental Protection Agency
Er	Ernest Silt Loam
EQB	Environmental Quality Board
FS	Feasibility Study
GC	Gas Chromatograph
GL	Gilpin Silt Loam
gpm	gallons per minute
GPR	Ground Penetrating Radar
GQF	Gilpin-Upshur Complex
GSF	Gilpin, Weikert, and Culleoka Shaly Silt Loams
HAZWRAP	Hazardous Waste Remedial Actions Program

IAP	International Airport
IRP	Installation Restoration Program
JP-4	Jet Propellant #4
NCP	National Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
OD	outer diameter
OWS	oil/water separator
PA	Preliminary Assessment
PaDER	Pennsylvania Department of Environmental Resources
PID	Photoionization Detector
POL	Petroleum, Oil, and Lubricants
ppb	parts per billion
ppm	parts per million
PVC	Polyvinyl chloride
QC	Quality Control
RBC	Risk-Based Concentrations
RI	Remedial Investigation
SHS	Statewide Human Health Standard
SI	Site Investigation
SOV	Soil Organic Vapor
TAC	Tactical Air Command
TD	total depth
TPH	total petroleum hydrocarbons
UC	Urban Land-Culleoka Complex
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
UST	underground storage tank
VOC	Volatile Organic Compound
WP	Work Plan
WPA	Work Plan Addendum
Wh	Wharton Silt Loam

EXECUTIVE SUMMARY

This Site Investigation (SI) Report documents activities The Earth Technology Corporation (EARTH TECH) performed at the 171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania, under the U.S. Department of Defense Installation Restoration Program (IRP). One IRP site, Site 7, was addressed in this SI. The objectives of the SI were to:

- Confirm the presence or absence of soil contaminants and characterize the nature of any identified contamination
- Evaluate the potential for contaminant release and migration
- Develop recommendations for additional investigative activities, immediate or interim response actions, and/or no further action.

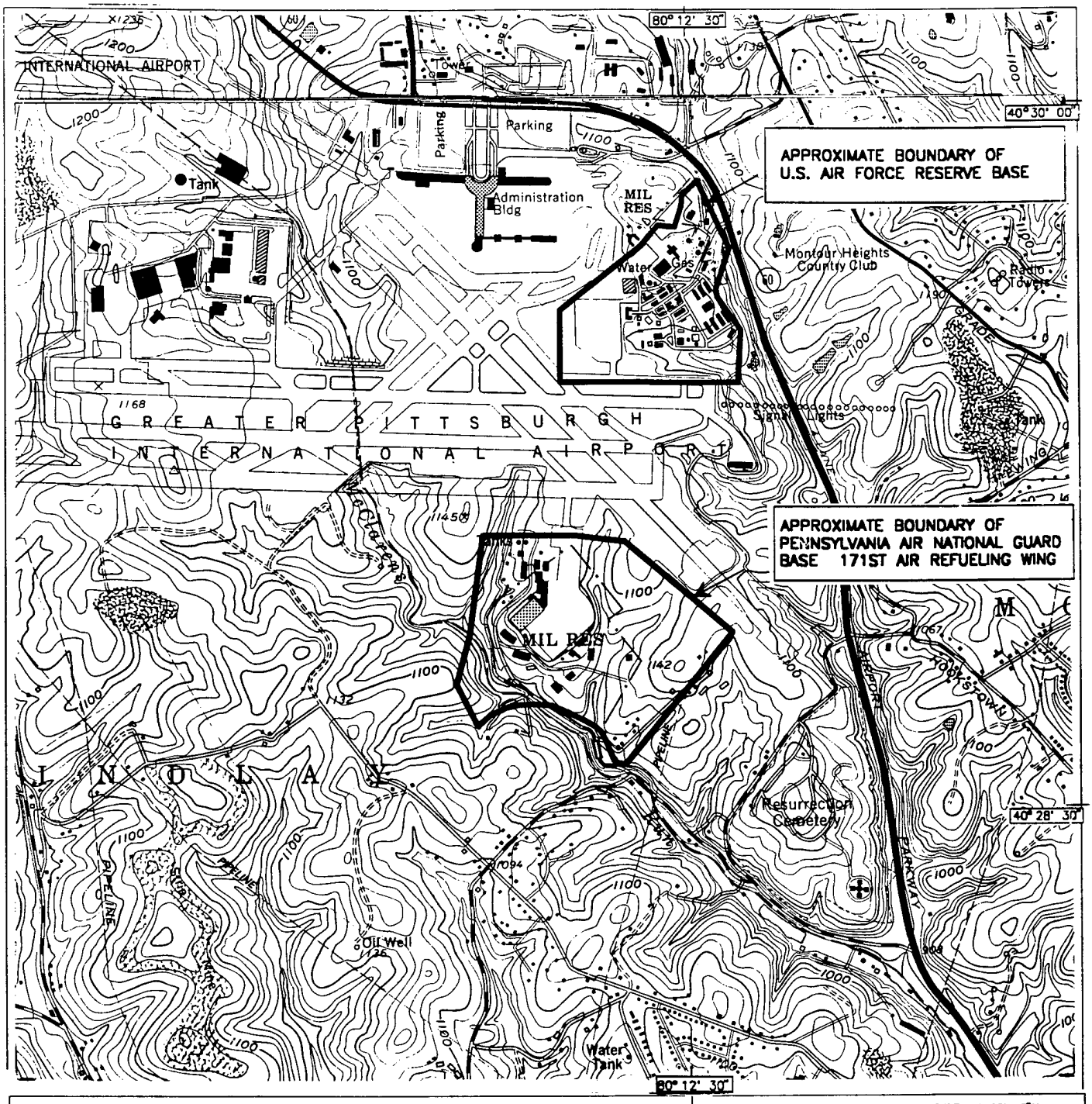
FIELD PROGRAM

Field activities, conducted from October 31 to November 18, 1994 and August 23 to August 31, 1995, included both screening and confirmational activities at the two areas which make up Site 7, the Petroleum, Oil, and Lubricants (POL) Storage Area and the Fuel Hydrant Pipeline. Screening activities included a geophysical survey, installation of temporary piezometers, soil organic vapor survey and, soil and groundwater sample collection and on-site analysis. Confirmation activities included collection and laboratory analysis of sediment and soil samples for total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene, and total xylenes (BTEX).

GEOLOGY AND HYDROGEOLOGY

Subsurface soils at Site 7 primarily consist of clays with lesser amounts of sands, silts, and weathered shale fragments. Some sand and silt deposits may be reworked fill used for previous site area construction. Subsurface soils are underlain by bedrock of the Pennsylvanian-aged Conemaugh Group, primarily a series of interbedded limestones, shales, sandstones, and siltstones. Local subsurface soils developed over weathered sections of bedrock, as evidenced by the presence of weathered bedrock clasts. Depth to bedrock ranged from 1 ft to 18 ft bgs.

Localized saturated zones were identified in the surface soils. The presence of groundwater in the soils is noted on the boring log for SB15 and is evident with the collection of groundwater screening samples. The shallow depths from which groundwater was collected for screening suggest perched conditions may exist. If fuel contamination was present, the perched water may impede vertical migration into the bedrock.



SOURCE: USGS 7.5 MINUTE QUADRANGLE(S) FOR: OAKDALE, PA (1960–PHOTOREVISED 1990)

LATITUDE: 40° 28' 45"N
LONGITUDE: 80° 13' 15" W
UTM CO-ORDINATES: 4815000mN 564000mE

SCALE 1:24,000

1 1/2 0 1 MILE

1 0 1000 2000 3000 4000 5000 6000 7000 FEET

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

LOCATION

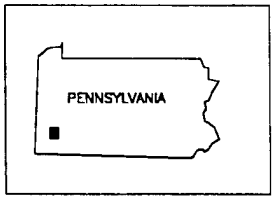


FIGURE 2–1

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

TOPOGRAPHIC MAP OF PENNSYLVANIA AIR NATIONAL GUARD PITTSBURGH INTERNATIONAL AIRPORT

1/96

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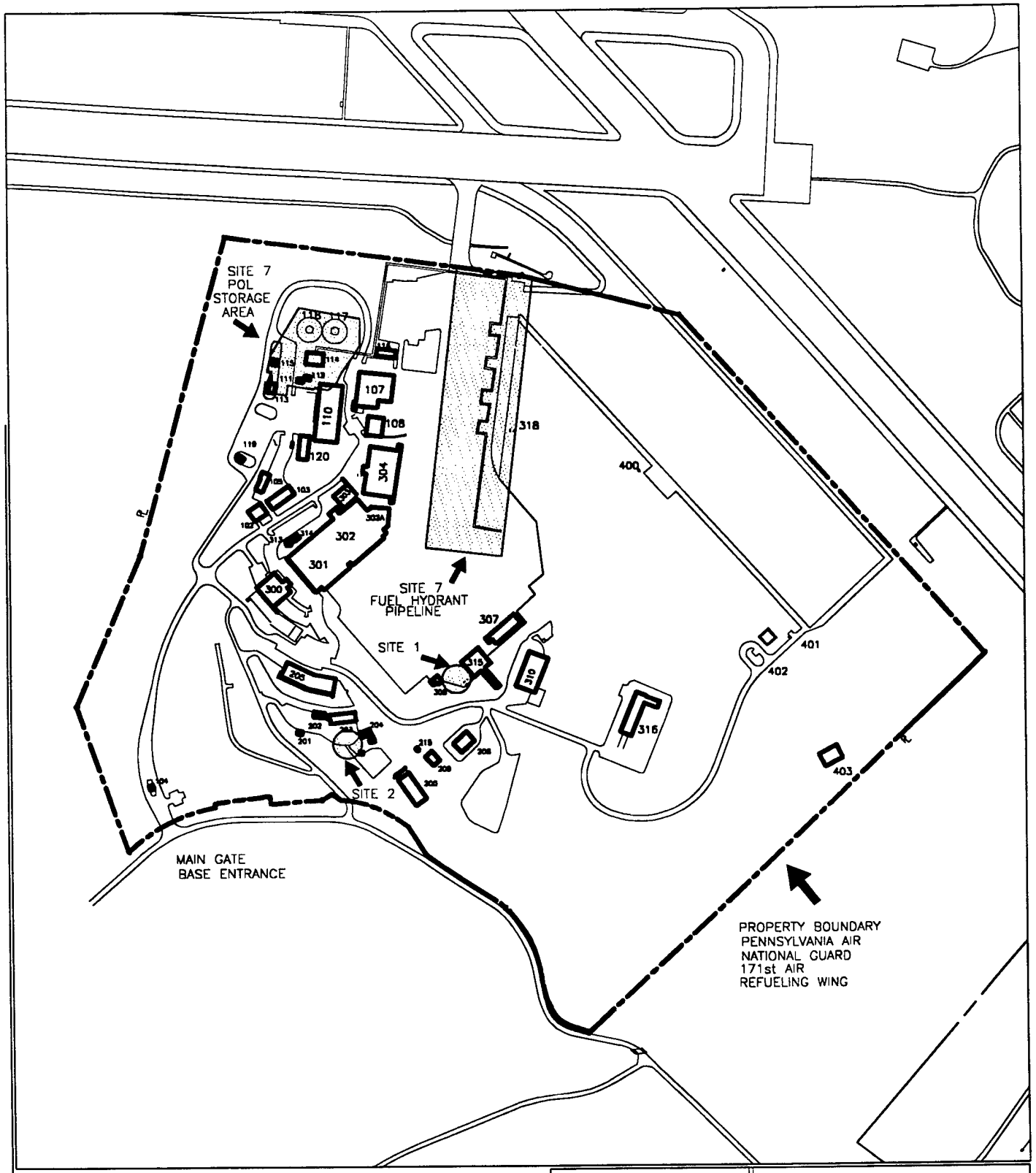

FIGURE 2-2

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

BASE MAP
INDICATING SITE LOCATIONS
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT

1/96

PFIG6-16.DWG 10/95

(Figure 2-1), and were not designated ANG IRP sites. The purpose of the PA was to evaluate the potential for contaminant releases from past operations on DOD property that may have involved the storage or disposal of hazardous materials or wastes.

Following the PA, review of Site 1, Waste Oil Tank data led to the conclusion that no further action was necessary. A Site Inspection was conducted at Site 2, Underground Storage Tank Motor Pool Area in 1988, where a leaking underground storage tank (UST) was removed in 1983. Based upon the Site Inspection and associated baseline risk assessment, a recommendation was made for no further action.

Site 7, Petroleum, Oil, and Lubricants (POL) Area (Figure 2-2), was identified in 1991 when Base construction/excavation activities led to ponding of free-phase hydrocarbons assumed to be of Jet Propellant #4 (JP-4) fuel origin. Soil sample results indicated that total petroleum hydrocarbons (TPH) were present in the soil and further site investigation was required.

2.2 SITE DESCRIPTION

Site 7 - POL Area is located on the northwest portion of the Base and is composed of two areas, the POL Storage Area (Figure 2-3) and the Fuel Hydrant Pipeline (Figure 2-4). In 1978, the POL Storage Area was built in an excavated hillside to provide storage and dispensing of JP-4 fuel to the flightline. Immediately topographically down-gradient of the POL Storage Area is a tributary stream which empties into McClarens Run, a creek which flows off-base. Within the compound of the POL Storage Area there are two 210,000-gallon JP-4 aboveground storage tanks (ASTs), numbered 117-1A and 118-1A, and associated pipelines.

Within the POL storage compound there are five structures: Fuels Maintenance (Building 111), the main pump house (Building 114), the receiving pump house (Building 115), a toolroom/office (Building 112), and the POL laboratory (Building 113). Building 113 is a fuel testing laboratory where lab equipment, containing residual fuel, is rinsed and cleaned in a sink which runs to an interceptor and UST adjacent to the building. A 2,000-gallon UST and 500-gallon oil/water separator (OWS), installed in 1978, are located west of Building 114 (Radian, 1994). The 2,000-gallon UST is used as a fuel reclaim tank. It is used to catch fuel when bleeding off the lines from fuel tank trucks and for putting good jet fuel from other sources back into the hydrant system. The aboveground OWS is currently non-functional, but was installed to separate any hydrocarbons observed in the storm drainage from the POL area, after inspection and observation of any storm water collected. If there was no sheen or hydrocarbons observed on the water, a manual gas valve was opened to drain the water to the sanitary sewer. A 65-gallon UST and OWS were also installed in 1978, south of Building 113, to separate fuel from the water used to clean empty lab equipment in the POL Fuels Laboratory. A contractor periodically pumped out the tank and interceptor until 1987. Since then, the Base has been responsible for pumping out the UST and OWS.

The fuel hydrant pipeline includes approximately 5,180 ft of underground piping which extends from the pump house in the POL Storage Area uphill to the west aircraft parking apron. The piping consists of 12-inch diameter Schedule 80, stainless steel with a bituminous coating, except for 150 ft that are carbon steel pipe. The 150 ft of carbon steel pipe is located in the POL compound, on the receiving side of the fuel system. All the pipeline fittings

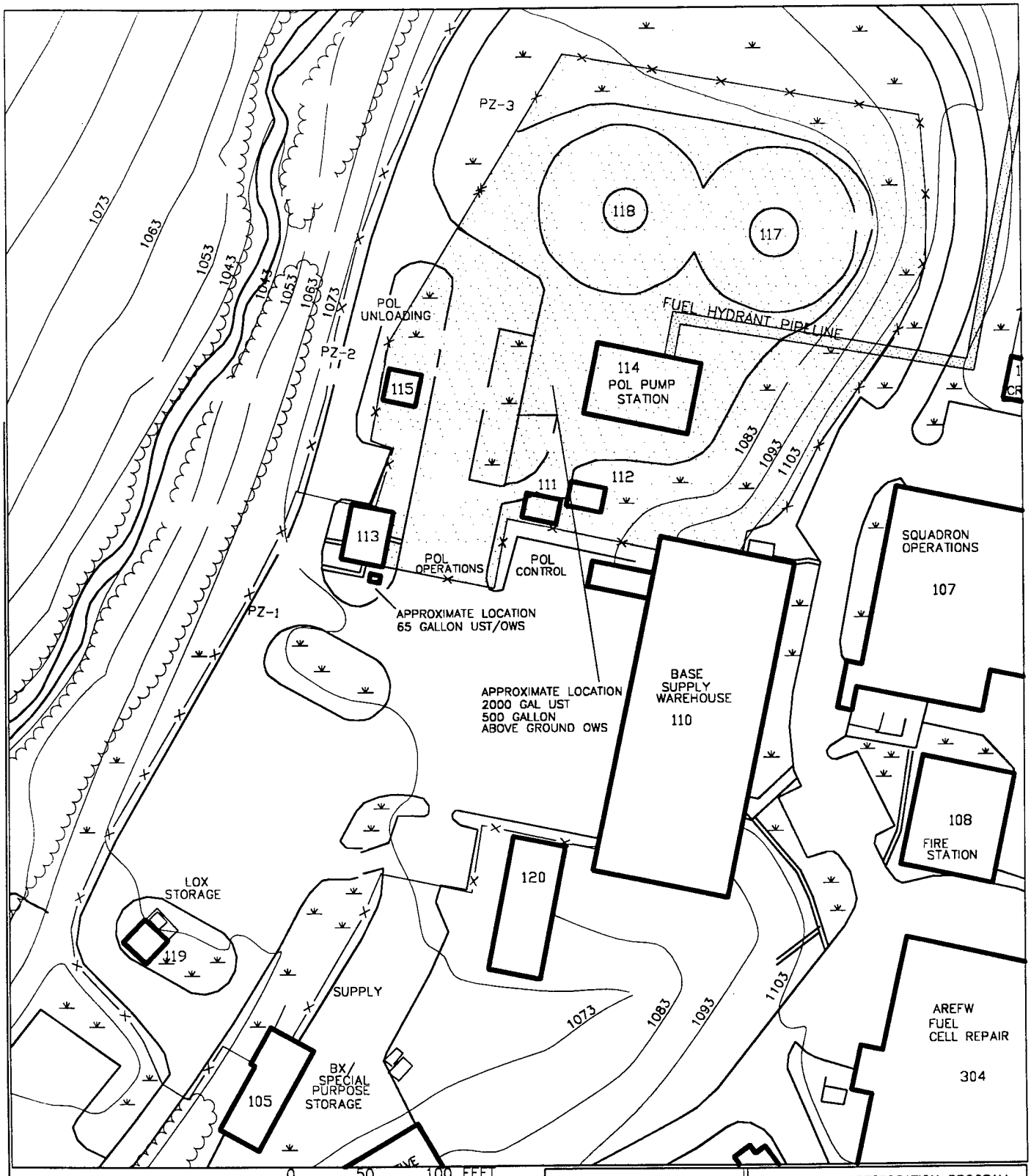

FIGURE 2-3

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – POL STORAGE AREA
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT

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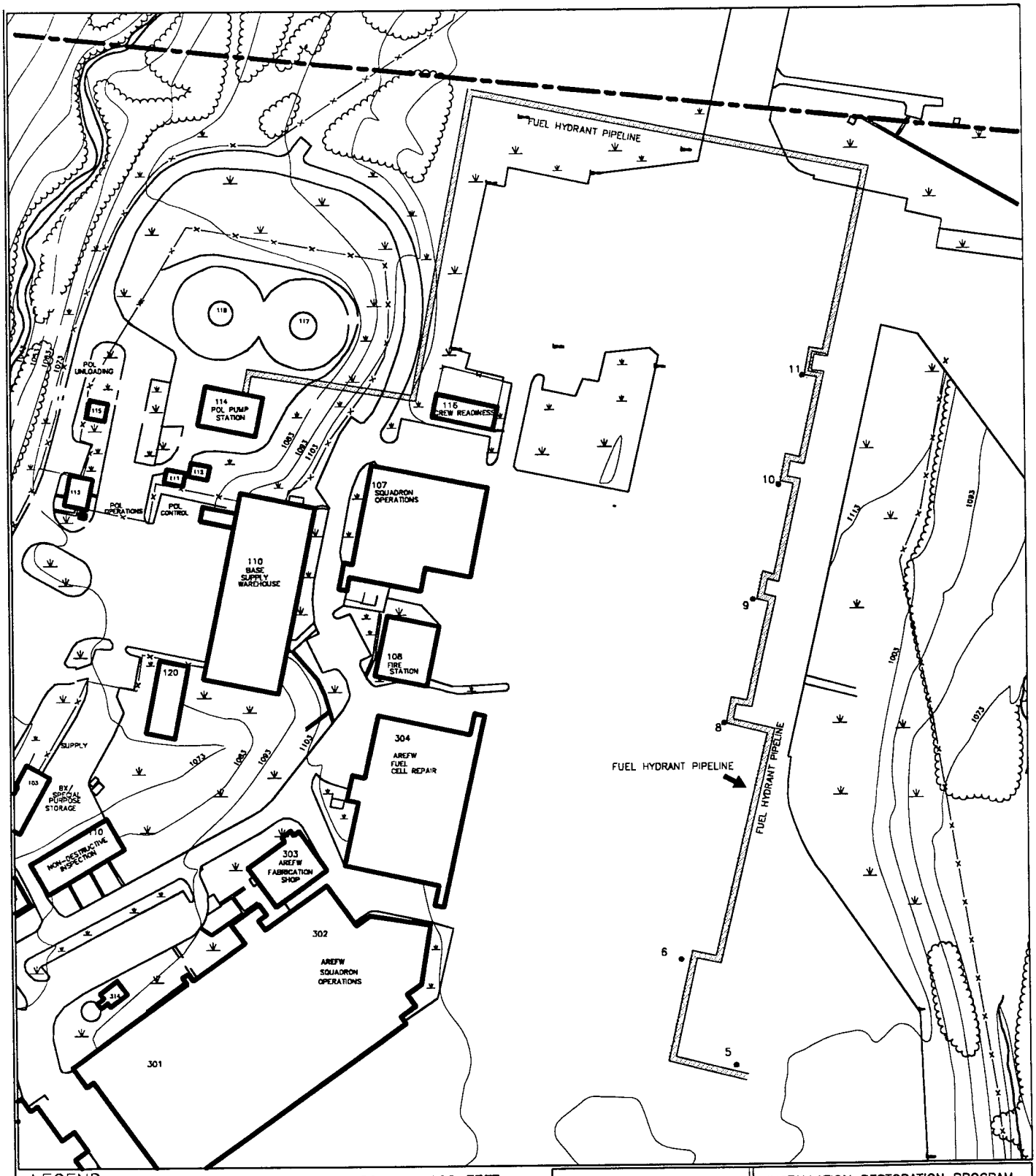


FIGURE 2-4

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – FUEL HYDRANT PIPELINE
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT

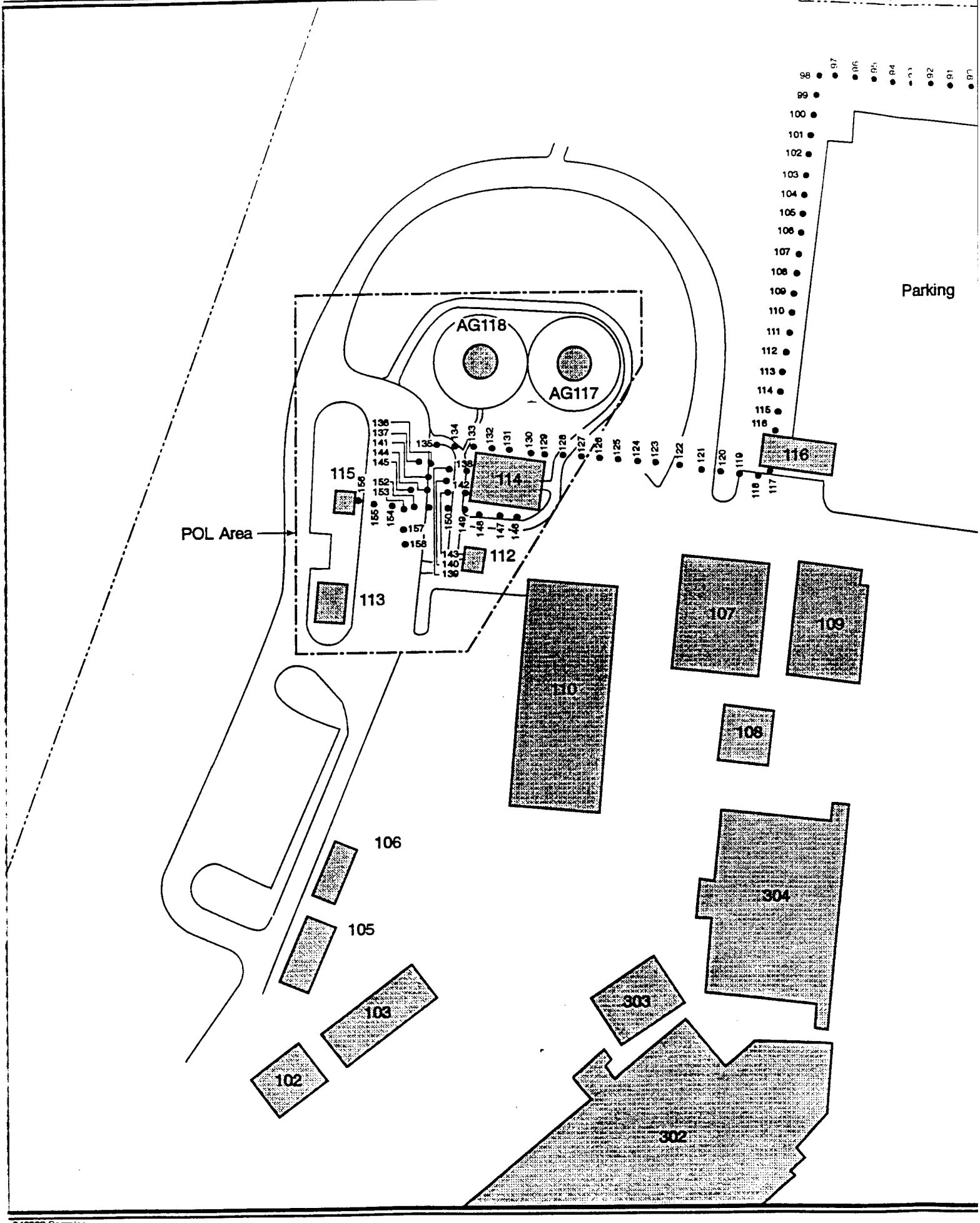
1/96

PFIG2-04.DWG 10/95

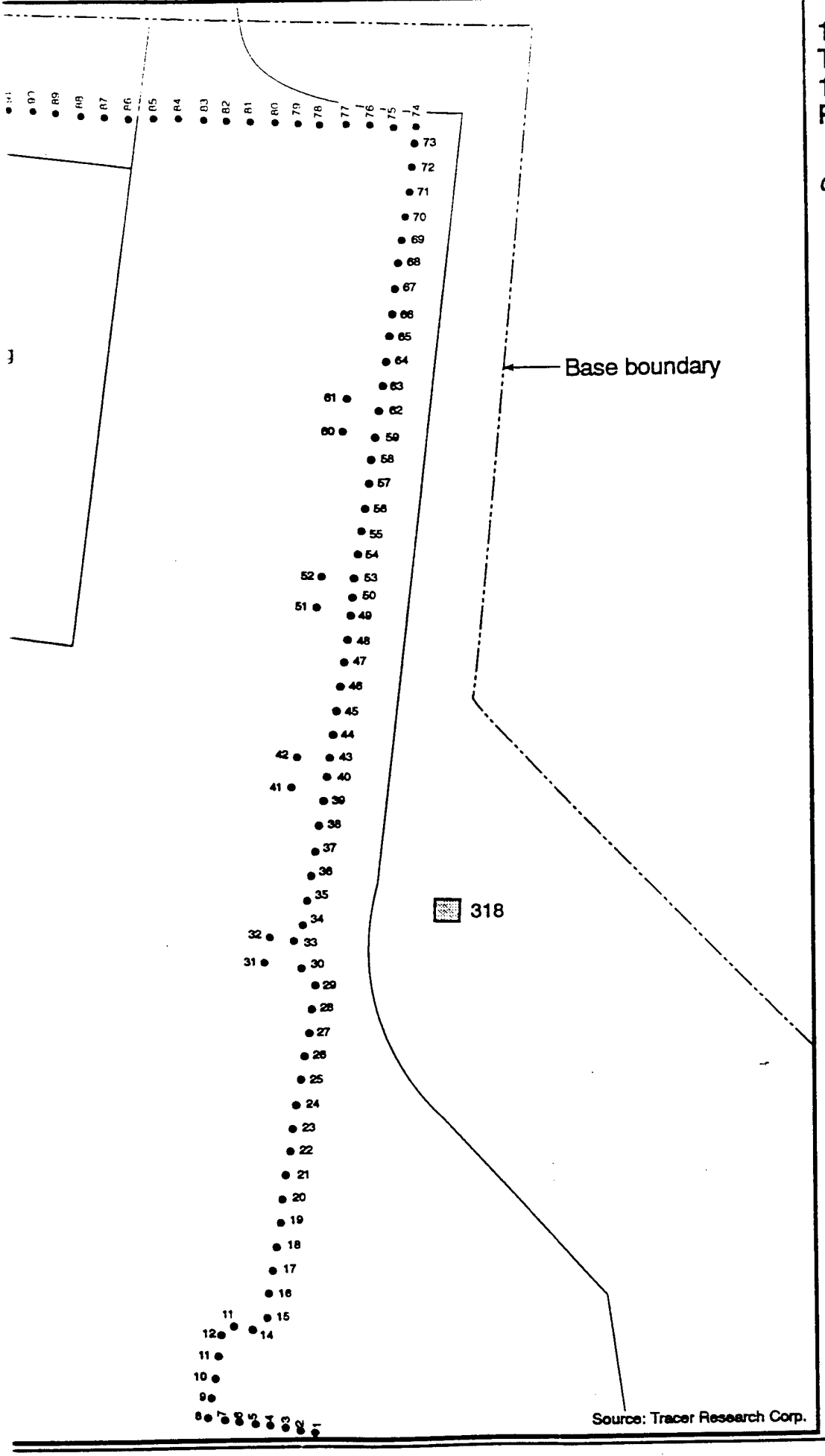
were radiographed following construction and found to be solid. The pipeline is cathodically protected with either sacrificial anodes or impressed current. A cathodic protection survey was conducted by the ANG Civil Engineering Technical Service Center. Results of the survey indicated no problems with the cathodic protection system. The typical depth of the pipeline is between 4 to 5 ft below ground surface (bgs) (Huntley & Huntley, 1991). Approximately 3,160 ft of the pipeline is under a concrete or asphalt surface. The underground fuel lines are connected to Hydrant Pits 5, 6, 8, 9, 10, and 11.

On November 19, 1991, the Base excavated an area beginning near Building 115 and extending to the emergency shower station near Building 114 (Figure 2-3). The purpose of the excavation was to repair a broken water line, which reportedly was still broken in 1994. After excavating to a depth of approximately 2.5 ft bgs, a ponding of water with free-phase hydrocarbons was discovered. It was assumed that the contamination was JP-4 fuel-related. The area was covered to prevent release of the water and the Pennsylvania Department of Environmental Resources (PaDER) was notified. A tank tightness test (Tracer Tight Leak Test®) was subsequently conducted to evaluate and establish the integrity of the underground JP-4 fuel lines by Huntley & Huntley Environmental Services Inc. (Huntley & Huntley, 1991). Tracer Tight Leak Test® probe locations are shown on Figure 2-5. The results indicated no leaks were present in the fuel lines.

A soil gas analysis was conducted at selected locations by Huntley & Huntley to identify additional areas of contamination in the vicinity of the POL Storage Area (Figure 2-6). Table 2-1 presents the soil gas analytical results. Total volatile hydrocarbons were detected in 11 out of 34 samples. Soil samples were also collected along the perimeter of the fuel line (specific locations where the soil samples were collected were not available) and analyzed in accordance with the PaDER's guidelines. The 1991 PaDER guidance document entitled "Interim Guidance - Protective Levels for the Excavation, Treatment, Cleanup, and Disposal of Virgin Fuel Contaminated Soils," established three levels of standards (A through C) for soil cleanup levels for the major hazardous constituents in fuels. Laboratory analysis results, listed in Table 2-2, indicated TPH was present in all 11 of the soil samples in concentrations above regulatory limits. The 1991 PaDER protection level for TPH in soil was 10 parts per million (ppm) for Level A and 100 ppm for Levels B and C. As of 1993, the PaDER guidance cleanup standards for contaminated soils established the cleanup criteria for virgin fuel-contaminated soil, as a TPH concentration of 200 ppm (Commonwealth of Pennsylvania, 1993). As of 1995, the PaDER remediation standard was established as 500 ppm for soil (Commonwealth of Pennsylvania, 1995).



948902 Samples



1991 Tracer Tight Test Probe Locations 171st ARW Pennsylvania ANG

Coraopolis, Pennsylvania

Legend

114
Building

Base boundary

●17
Probe location

North

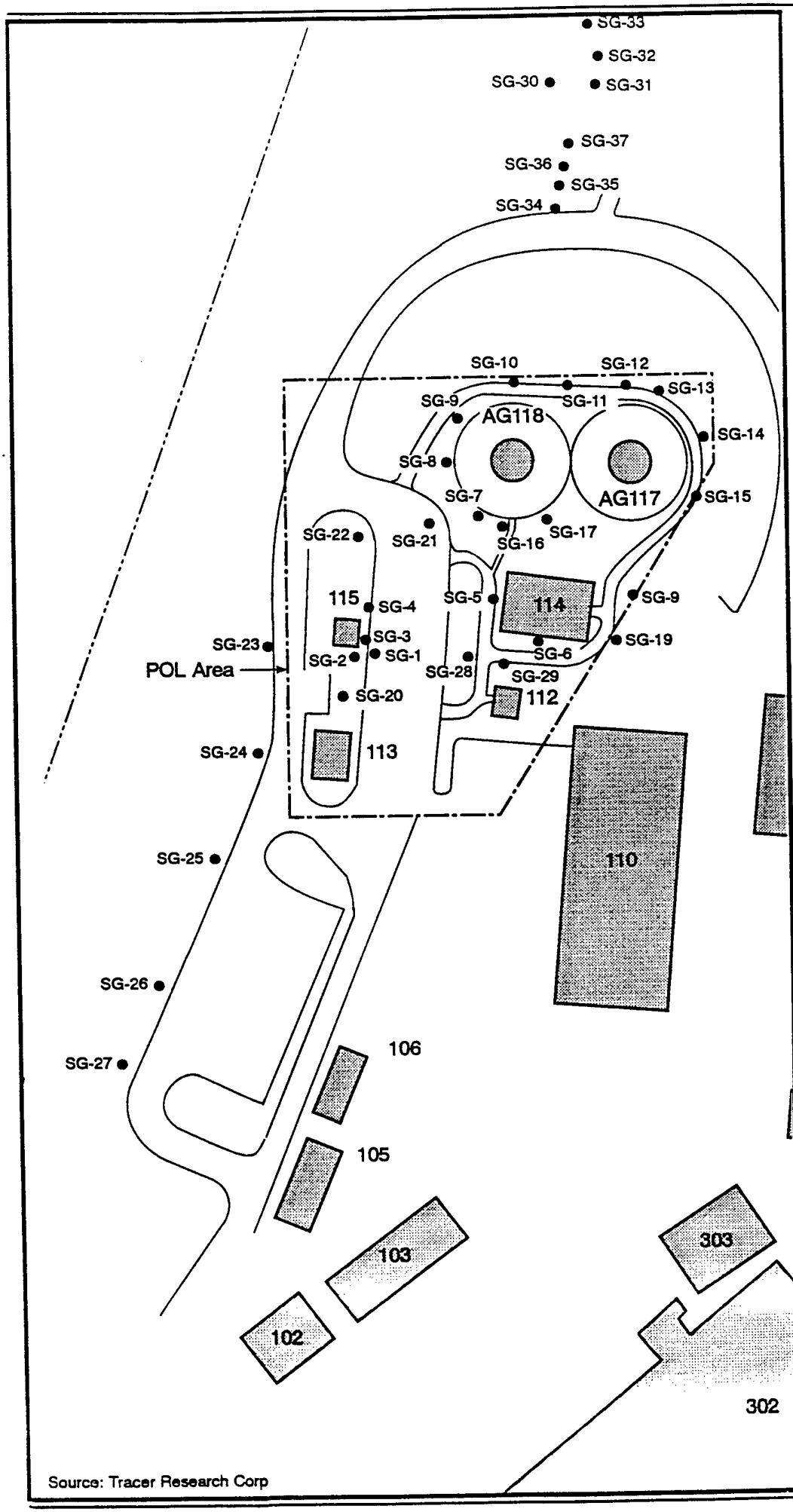
0 125 feet
Approximate scale

Source: Tracer Research Corp.

The Earth Technology Corporation®

Figure 2-5

8-94



1991 Soil Gas Sampling Locations 171st ARW Pennsylvania ANG

Coraopolis, Pennsylvania

Legend

114
Building

Base boundary

● SG-1
Sampling probe location

North

0 125 feet
Approximate scale

Source: Tracer Research Corp

The Earth Technology Corporation

Figure 2-6

Table 2-1 1991 Soil Gas Analytical Results
171st Air Refueling Wing, Pennsylvania ANG
Coraopolis, Pennsylvania

Sample	Benzene (μg/L)	Toluene (μg/L)	Ethyl Benzene (μg/L)	Xylenes (μg/L)	TVHC (μg/L)
SG-1	< 12	< 73	110	73	1400
SG-2	< 0.04	< 0.07	0.8	< 0.2	3
SC-3	< 0.04	< 0.07	< 0.1	< 0.2	0.4
SC-4	0.2	< 0.07	< 0.1	< 0.2	< 0.2
SC-5	0.08	< 0.07	< 0.1	< 0.2	< 0.2
SC-6	0.07	< 0.07	< 0.1	< 0.2	< 0.2
SC-7	< 0.04	< 0.07	< 0.1	< 0.2	< 0.2
SC-8	< 0.04	< 0.07	< 0.1	6	47
SC-9	< 0.04	< 0.07	< 0.1	6	38
SC-10	0.06	< 0.07	< 0.1	< 0.2	< 0.2
SC-11	< 0.04	< 0.07	< 0.1	< 0.2	5
SC-12	0.1	< 0.07	< 0.1	< 0.2	0.2
SC-16	< 0.04	< 0.07	< 0.1	< 0.2	< 0.2
SC-17	< 0.04	< 0.07	< 0.1	< 0.2	< 0.2
SC-18	0.08	< 0.07	< 0.1	< 0.2	< 0.2
SC-19	0.07	< 0.07	< 0.1	< 0.2	< 0.2
SC-20	< 0.02	< 0.04	< 0.08	< 0.1	< 0.1
SC-21	< 0.02	< 0.04	< 0.08	< 0.1	1
SC-22	0.07	< 0.04	< 0.08	< 0.1	< 0.1
SC-23	< 0.02	< 0.04	< 0.08	< 0.1	< 0.1
SC-24	0.04	< 0.04	< 0.08	< 0.1	< 0.1
SC-25	0.02	< 0.04	< 0.08	< 0.1	0.7
SC-26	0.06	< 0.04	< 0.08	< 0.1	< 0.1
SC-27	<0.02	< 0.04	< 0.08	< 0.1	< 0.1
SC-28	0.02	< 0.04	< 0.08	< 0.1	< 0.1
SC-29	< 0.02	< 0.04	< 0.08	< 0.1	0.5
SC-30	0.2	< 0.04	< 0.08	< 0.1	0.6
SC-31	0.04	< 0.04	< 0.08	< 0.1	< 0.1
SC-32	0.07	< 0.04	< 0.08	< 0.1	< 0.1
SC-33	< 0.02	< 0.04	< 0.08	< 0.1	< 0.1
SC-34	0.05	< 0.04	< 0.08	< 0.1	< 0.1
SC-35	< 0.02	< 0.04	< 0.08	< 0.1	< 0.1
SC-36	< 0.02	< 0.04	< 0.08	< 0.1	< 0.1
SC-37	0.07	< 0.04	< 0.08	< 0.1	< 0.1

Note: Samples 13 through 15 could not be collected due to saturated soils in this area.

Table 2-2 1991 Soil Sample Analytical Results
171st Air Refueling Wing, Pennsylvania ANG
Coraopolis, Pennsylvania

Sample	Benzene (ppm)	Toluene (ppm)	Ethyl Benzene (ppm)	Xylenes (ppm)	TPH (ppm)
001	< 0.01	0.029	<0.01	0.026	129
002	< 0.01	< 0.01	< 0.01	0.018	23.9
003	< 0.01	0.013	< 0.01	0.011	35.2
004	< 0.01	0.012	< 0.01	0.036	73.8
005	< 0.01	< 0.01	< 0.01	0.012	41.0
006	< 0.01	0.026	< 0.01	0.043	34.3
007	< 0.01	< 0.01	< 0.01	0.023	166
008	< 0.01	0.014	< 0.01	0.021	54.0
009	< 0.01	< 0.01	< 0.01	< 0.01	81
010*	< 0.01	0.011	< 0.01	< 0.01	45.7
011	< 1.00	1.81	1.52	6.47	1770

* Sample 010 is the duplicate for sample 006.

3.0 ENVIRONMENTAL SETTING

The following section describes the environmental conditions at the 171st ARW, Pennsylvania ANG Base and the surrounding area.

3.1 CLIMATE

The city of Pittsburgh and Pittsburgh IAP are located approximately 100 miles south of Lake Erie, in the foothills of the Allegheny Mountains, at the confluence of the Allegheny and Monongahela Rivers. The area features a humid continental climate modified slightly by the Great Lakes and Atlantic Seaboard. Precipitation is fairly evenly distributed throughout the year. Table 3-1 summarizes the climate statistics for the airport area.

Table 3-1 Climatic Statistics for Pittsburgh International Airport Coraopolis, Pennsylvania

Average Daily Minimum Temperature	January 19°F[1] July 61°F
Average Daily Maximum Temperature	January 35.5°F[1] July 83°F
Average Annual Rainfall	36 inches (NOAA)
Average Annual Snowfall	42.2 inches (NOAA)
Net Precipitation	12 inches
One-Year 24-Hour Rainfall Intensity	2.3 inches (NOAA)

Source: National Oceanic and Atmospheric Administration (NOAA), 1992.
[1]ABB-Environmental Services, Inc., 1991.

3.2 TOPOGRAPHY

Allegheny County is located in the Appalachian Plateau Physiographic Province, in an area dissected by narrow, nearly level stream valleys with steep sides. The ridgetops are mostly gently sloping to moderately steep.

Almost the entire terrain surrounding the Pittsburgh IAP is sloped, with slopes of up to 25% in some areas. The surrounding area is steeply sloped with elevations on ridgetops exceeding 1,200 ft above mean sea level (AMSL). Surface drainage is rapid due to the slopes and erosion can occur on unvegetated areas. Construction of runways and associated airport facilities required leveling of the sloped terrain. The elevation in these areas averages approximately 1,100 ft AMSL.

3.3 GEOLOGY

Allegheny County is located on the Appalachian Plateau. The county is underlain by flat lying Pennsylvanian-age sedimentary rock consisting of clay, shale, sandstone, limestone, and coal in interlayered beds of varying thicknesses. These sedimentary rocks are divided into five geologic groups, and in order of increasing age and depth include the Dunkard, Monongahela, Conemaugh, Allegheny, and Pottsville Groups. A geologic sequence is presented in Table 3-2 (Wagner et al, 1975). A regional geological map is presented on Figure 3-1. The sedimentary rock units dip slightly to the southwest. The total thickness of the Pennsylvanian-age rock sequences is about 1,300 ft (Weston, 1984). A generalized regional geologic cross section is presented on Figure 3-2.

All of the five Pennsylvanian-age groups referred to above have been exposed locally by erosion in various parts of Allegheny County. In the vicinity of the Base, erosion has removed the two younger groups, the Dunkard and the Monongahela. The Conemaugh, the Allegheny, and the Pottsville Groups remain in the subsurface and are discussed below.

The Conemaugh Group, which is the first geologic group encountered beneath the Base, includes two primary formations separated by a thin limestone marker bed (the Ames Limestone) (Weston, 1984). The upper formation is the Casselman Formation; the lower formation is the Glenshaw Formation. The Casselman Formation ranges from 200 to 400 ft in thickness and is described as a cyclical sequence of sandstone, shale, red beds, and thin layers of limestone and coal. Clays and silty shales are dominant in this formation. In some places, the silty shales grade laterally into sandy shales and sandstones. Limestone beds and coal seams are thin and irregular. The Glenshaw Formation ranges from 300 to 350 ft in thickness and is composed of cyclical sequences as sandstone, shale, red beds, limestone, and coal.

The Allegheny Group underlies the Conemaugh Group and ranges from 280 to 320 ft in thickness (Weston, 1984). This group is comprised of cyclical sequences of shale, sandstone, limestone, and coal. The top of the group is the Upper Freeport Coal and the base of the group is the Brookville Coal. Commercial mineral deposits within the Allegheny Group include the Vanport Limestone and the Kittanning and Clarion Coals (Weston, 1984).

The Pottsville Group underlies the Allegheny Group and ranges from 120 to 230 ft in thickness (Weston, 1984). This group is comprised of sandstone and shale and contains some conglomerates. It is mined locally for coal (Weston, 1984).

A number of subparallel folds of low amplitude tend to obscure the regional southwest dip of the Pennsylvanian-age rocks that outcrop in Allegheny County. The subparallel folds strike approximately north 30 degrees east and become progressively sharper and more nearly parallel toward the eastern boundary of the county (Adamson et al, 1949). Within Allegheny County, reportedly faults and joints have not been exposed on the surface; however, fractures are noted to occur in the Allegheny Group, underlying the Conemaugh Group.

Two common geologic problems in Allegheny County are landslides and subsidence. Landslides occur when a soil or rock slope becomes unstable and moves downhill under gravity. Subsidence occurring in the county is related to mining activities and refers to

Table 3-2 Geologic Units in Allegheny County, Pennsylvania

Age	Name	Thickness and areal extent	Lithologic character	Hydrologic character
QUATERNARY	Alluvium	0-65 feet; thins out at edges of valleys. Relatively small areal extent, confined to valleys of larger streams.	Well to poorly-sorted deposits of clay, sand, gravel, and cobbles.	Yields 5-3000 gpm, depending upon degree of sorting by grain size.
PERMIAN / PENNSYLVANIAN Dunkard Group		(not found beneath Air Force facilities)		
PENNSYLVANIAN Monongahela Group		(not found beneath Air Force facilities)		
Conemaugh Group Casselman Formation	Upper and Lower Pittsburgh Limestone	50 feet combined thickness.	Limestones with interbedded or sandy shales and a thin coal bed.	Yields to 15 gpm. Generally lower.
	Connellsville Sandstone	20-75 feet.	Coarse-grained, micaceous sandstone.	Yields to 25 gpm; maximum yields are in southern part of county.
	Little Clarksburg coal	Thin and discontinuous.	Coal and shaly equivalent.	Yields 1-5 gpm.
	Clarksburg Limestone	0-3 feet.	Limestone, or shaly equivalent.	Yields 1-5 gpm.
	Morgantown Sandstone	90-120 feet, thinning toward northeast.	Compact, fine-grained, thick-bedded sandstone; persistent and locally massive.	Yields to 120 gpm; average 30 gpm.
	Birmingham Shale	50-60 feet.	Grades from shale to sandy shale; contains some sandstone lenses.	Yields 1-2 gpm.
	Duquesne coal	0-4 feet.	May be sandy shale locally; discontinuous.	Not known.
Glenshaw Formation	Ames Limestone	3-8 feet.	Locally contains solution channels along bedding and joint planes.	Minimal supplies from bedding plane passages.
	Pittsburgh Red Beds	5-15 feet.	Greenish-gray, red and variegated shales.	Minimal supplies from bedding plane passages.

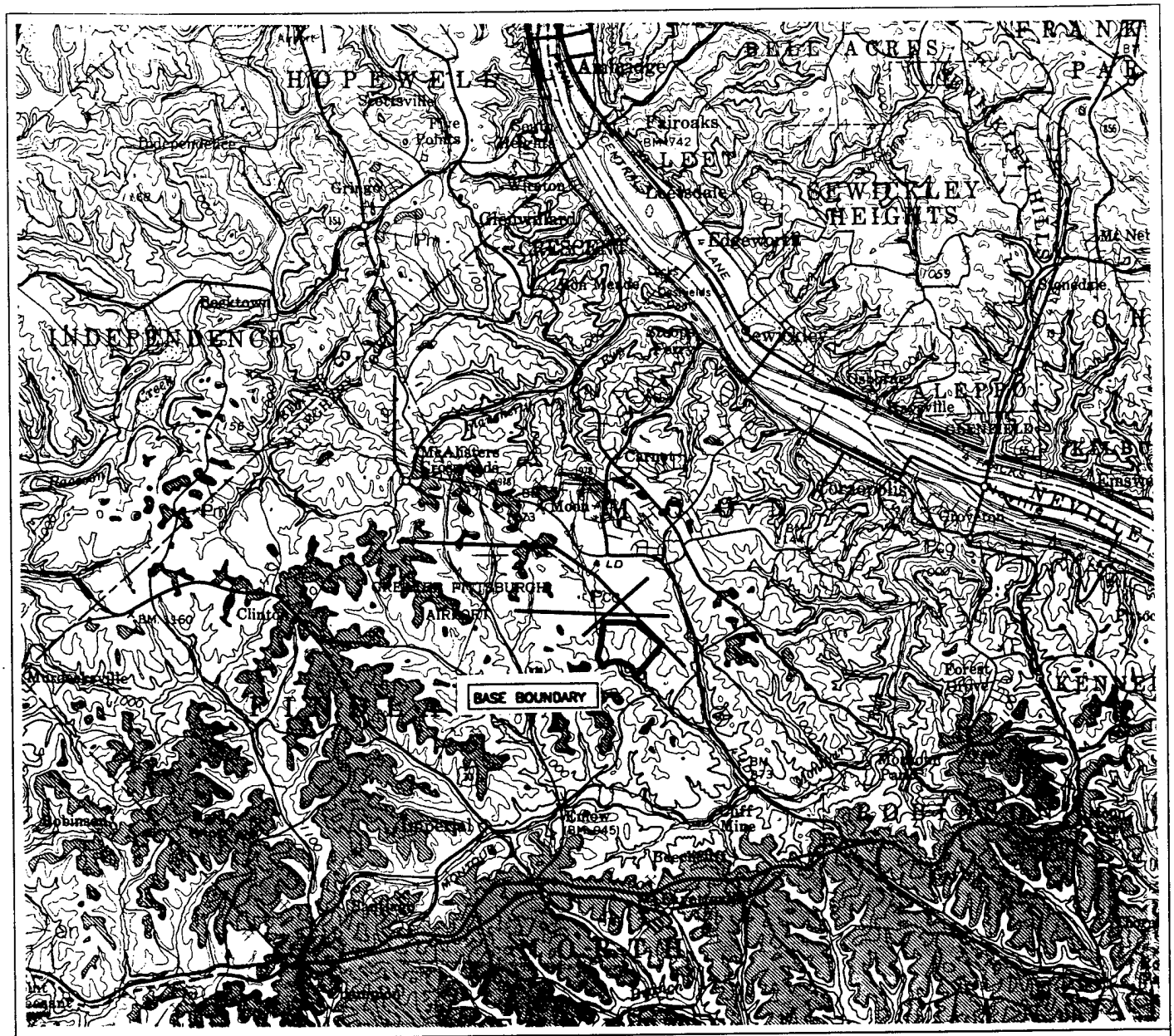
Table 3-2 Geologic Units in Allegheny County, Pennsylvania (Continued)

Age	Name	Thickness and areal extent	Lithologic character	Hydrologic character
	Saltsburg Sandstone	30-80 feet.	White or gray massive sandstone, locally grading into sandy shale.	Yields 2-400 gpm; averages 55 gpm.
	Bakerstown coal and associated rocks	10-20 feet.	Coal, shale, and limestone; locally replaced by Saltsburg Sandstone.	Yields 3 gpm.
	Buffalo Sandstone		Coarse-grained and conglomeratic sandstone, grading laterally into fine-grained sandstone or sandy shales in western part of county.	Yields to 20 gpm.
	Brush Creek coal and associated rocks		Coal, shale, clay, and limestone.	Yields 4-20 gpm.
	Mahoning Sandstone	20-60 feet.	Medium- to coarse-grained, commonly two beds separated by a shale layer.	Yields 4-60 gpm, varying with depth and degree of fracturing.
Allegheny Group	Upper Freeport coal and associated rocks	30-40 feet.	Coal, clay, and shale.	Not known.
	Butler Sandstone	10-40 feet.	Coarse-grained or massive sandstone in north; grading to thin-bedded, sandy shale with sandstone lenses in the southern part of county.	Yields 2-10 gpm.
	Freeport Sandstone	30-70 feet usually, but 120 feet along Ohio River to the West.	Massive, locally conglomeratic sandstone grading laterally to fine-grained sandstone or sandy shale.	Yields 5-75 gpm.
	Upper Kittanning coal and associated rocks		Coal, clay, and shale, with some sandstone lenses.	Not an aquifer.
	Worthington Sandstone	15-100 feet.	Lenticular sandstone of variable texture, grading laterally to shale.	Yields to 50 gpm.
	Vaport Limestone	20-40 feet.	Limestone with interbedded mudstone and clay.	Not an aquifer (Locally mined)
	Clarion Coal		Coal.	Not an aquifer (Locally mined)

Table 3-2 Geologic Units in Allegheny County, Pennsylvania (Continued)

Age	Name	Thickness and areal extent	Lithologic character	Hydrologic character
Pottsville Group	Brookville Coal		Coal.	Not an aquifer
	Homewood Sandstone	40-50 feet.	Medium to Coarse-Grained Sandstone.	Yields 20 gpm
	Mercer Coal		Coal	Not an aquifer
	Connoquesnessing Sandstone	60-115 feet.	Well-Sorted, Coarse-Grained and Conglomerate Sandstone, Lightly Cemented	Yields 550 gpm

Source: Phase I Record Search for Pittsburgh International Airport, Pittsburgh, PA, 1984.
NA - Information Not Available
gpm - gallons per minute



SCALE 1:125,000

5 4 3 2 1 0 5 MILES

ONE INCH EQUALS APPROXIMATELY 2 MILES

LEGEND

GROUP	FORMATION		DESCRIPTION
ALLUVIUM TERRACE DEPOSITS		Qt	Sand, clay, gravel on terraces above rivers; includes Carmichaels Formation
MONONGAHELA		Pm	Cyclic sequences of shale, limestone, sandstone and coal; contains Pittsburgh coal bed at base
CONEMAUGH	CASSELMAN	Pcc	Cyclic sequence of sandstone, shale, red beds and thin limestone and coal.
ALLEGHENY		Pa	Cyclic sequences of shale, sandstone, limestone, and coal; contains Brookville coal at base and Upper Freeport coal at top; within group are the commercial Vanport limestone and Kittanning and Clarion coals.
POTTSVILLE		Pp	Sandstone and Shale; contains some conglomerate and locally mineable coal.

N

SOURCE: PENNSYLVANIA BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY

FIGURE 3-1

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

REGIONAL GEOLOGICAL MAP
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT

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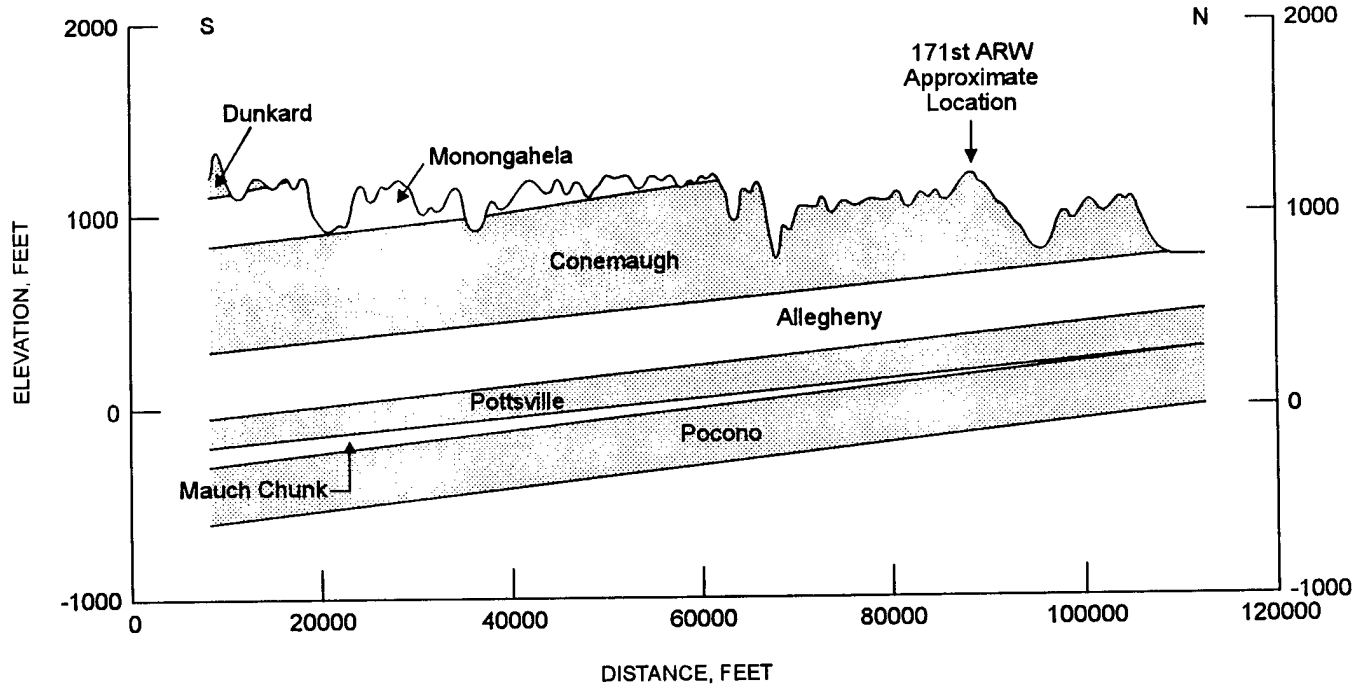
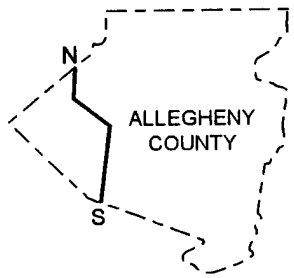


NOTE: VERTICAL EXAGGERATION = 20X

SCALE 1" = 1000' VERTICAL, 1" = 20000' HORIZONTAL



SOURCE: COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL
RESOURCES, W.R. WAGNER 1975

Figure 3-2

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171ST AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

REGIONAL CROSS SECTION OF ALLEGHENY COUNTY

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downward bowing or ground collapse over areas undermined for the removal of coal. Neither of these appear to be a problem at the Base (Weston, 1984). Also, karst features, such as sinkholes, solution channels, springs, etc. are not mapped or noted to be common in Allegheny County.

The unconsolidated deposits typically consist of two units: basal glacial origin sediments, immediately overlying the bedrock, and an uppermost layer of recent age alluvium (Weston, 1984). The basal glacial deposits and the Quaternary-age alluvium deposits consist of clay, silt, gravel, and boulders in varying amounts. In major stream valleys in the county, the recent deposits of alluvium overlie the bedrock. Glacial deposits and reworked fill are predominant on Base property, with alluvium deposits located along McClarens Run.

During the ABB-Environmental Services, Inc (ABB-ES) site inspection of the motor pool (ABB-ES, 1991), the depth to competent bedrock ranged from 9 to 23.5 ft bgs. Basewide, the bedrock is generally 15 to 20 ft bgs (Weston, 1984).

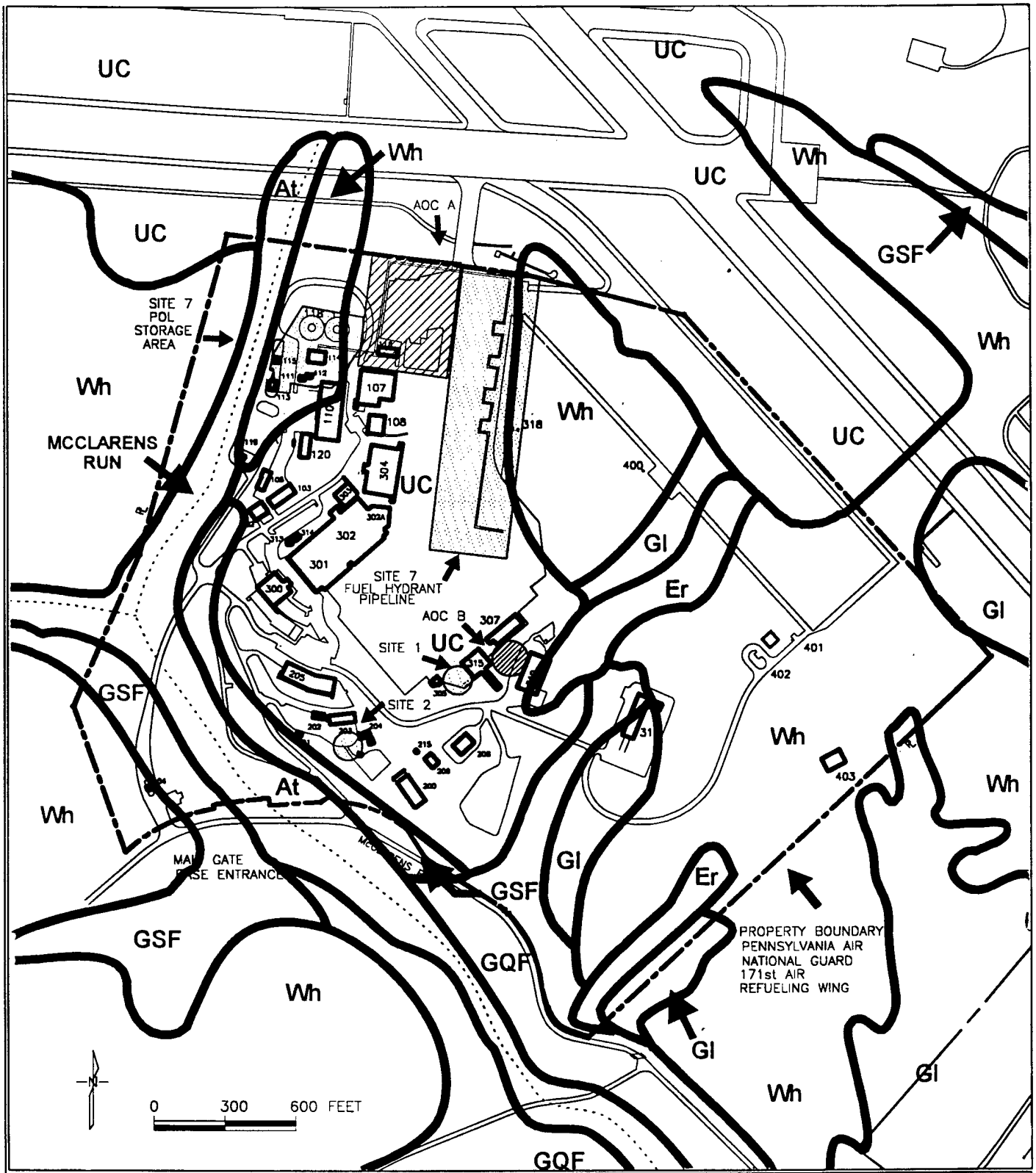
3.4 SOILS

Seven soil groups have been identified on, and adjacent to, the Base according to the Soil Survey of Allegheny County soil map (U.S. Department of Agriculture (USDA), 1981), and are shown on Figure 3-3. These seven groups are as follows:

- Atkins Silt Loam (At)
- Urban Land-Culleoka Complex (UC)
- Wharton Silt Loam (Wh)
- Ernest Silt Loam (Er)
- Gilpin Silt Loam (GL)
- Gilpin, Weikert, and Culleoka Shaly Silt Loams (GSF)
- Gilpin-Upshur Complex (GQF)

Characteristics of these soils are summarized in Table 3-3 and are discussed below.

At is found along the banks of McClarens Run (Figure 3-3). These soils consist of deep, nearly level poorly-drained soils which formed in relatively recent alluvium. A typical soil profile is 34 inches in depth. The surface layer of 8 inches is composed of grayish-brown silt loam. The subsoil is 26 inches thick and the upper 4 inches of the subsoil consists of mottled, gray, friable silt loam. In the next 8 inches of the subsurface, the soil is mottled, light brownish-gray, friable silt loam. The lower 14 inches of the subsoil is composed of mottled, light brownish-gray, friable loam. The substratum is composed of mottled, light brownish-gray loam and silty clay loam. Permeability is moderate, and the available water capacity is high (USDA, 1981).



LEGEND

- IRP SITE
- AREA OF CONCERN
- BUILDING
- ROAD
- ANG BOUNDARY

SOILS LEGEND

At	ATKINS SILT LOAM
Er	ERNEST SILT LOAM
Gl	GILPIN SILT LOAM
GQF	GILPIN–UPSHUR COMPLEX
GSF	GILPIN, WEIKERT, & CULLEOKA SHALY SILT LOAMS
UC	URBAN LAND–CULLEOKA COMPLEX
Wh	WHARTON SILT LOAM

FIGURE 3–3

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SOIL SURVEY MAP
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT

1/96

PFIG6–26.DWG 1/96

Table 3-3 Characteristics of Soils at Pittsburgh International Airport Coraopolis, Pennsylvania

Soil Name	Symbol	Brief Description	Slope (%)	Permeability (inches/hr)	Depth to Seasonal High Water Table	Depth to Bedrock
Atkins Silt Loam	At	Deep, nearly level, poorly drained soils on floodplains	0 to 8	0.6 to 6.0	0 to .5 ft	> 5 ft
Urban Land-Culleoka Complex[1]	UC	Land altered by man; original soils obscure	0 to 25	0.6 to 6.0	> 6 ft	1.5 to 3.5 ft
Wharton Silt Loam	Wh	Deep, nearly level to moderately steep, moderately well-drained soil on uplands	0 to 25	0.06 to 2.0	1.5 to 3 ft	> 4 ft
Ernest Silt Loam	ER	Deep, nearly level to moderately steep, moderately well-drained soils at the base of steeper upland slopes and near the head of some drainage ways	2 to 25	0.06 to 6.0	1.5 to 3 ft	> 5 ft
Gilpin Silt Loam	GI	Moderately deep, nearly level to very steep, well-drained soils on uplands	2 to 25	0.6 to 2.0	> 6	1.5 to 3.5 ft
Gilpin, Weikert, and Culleoka Shaly Silt Loams	GSF	Moderately deep, steep, well-drained soils on uplands	25 to 80	0.6 to 6.0	> 6 ft	1.5 to 3.5 ft
Gilpin-Upshur Complex[2]	GQF	Deep, gently sloping to very steep, well-drained soil on uplands	3 to 15	0.6 to 0.2	>3	4-6 ft

Source: USDA, Soil Conservation Service, 1981.
[1]Properties for this group are too highly variable to be estimated. Values indicated are representative of the Culleoka Series.
[2]Properties for this group are too highly variable to be estimated. Values indicated are representative of the Upshur Series.

The UC comprises the most predominant soil group found on Base and at Site 7. This complex is defined as 65 to 75% of Urban Land soils, 15 to 20 percent of Culleoka soils, and 10 to 15% of other soil types. In Urban Land portions, the natural soils and underlying bedrock have been cut from some places and used as fill in other places. The Culleoka soils are described as moderately deep, gently sloping to very steep, well-drained soils on uplands. These soils formed in material that weathered from shale, fine-grained sandstone, and limestone bedrock. A typical soil profile is approximately 27 to 29 inches thick. The surface layer is composed of dark-brown silt loam about 7 inches thick. The subsoil is about 20 inches thick. In the upper 3 inches of the subsoil, the soil is composed of yellowish-brown, friable silt loam. The 11-inch interval below is composed of a yellowish-brown, friable silty clay loam. The lower 6 inches of subsoil is composed of a yellowish-brown, friable gravelly clay loam. The substratum is composed of yellowish-brown, firm, gravelly clay loam. Shale and sandstone bedrock are encountered below an approximate depth of 29 inches (USDA, 1981).

Wh is found on the western edge of the POL Storage Area and east of McClarens Run on the northeastern portion of the Base. These soils are also found on both the east and west side of the east aircraft parking apron. They consist of deep, nearly level to moderately steep, moderately well-drained soils on uplands. These soils formed in material that weathered from acid, gray clay shale. A typical soil profile is approximately 55 inches in depth. The surface layer is about 10 inches thick. It is composed of very dark grayish-brown silt loam in the upper 3 inches and brown silt loam in the lower 7 inches. The subsoil is composed of yellowish-brown, very firm to firm silty clay loam approximately 32 inches thick. The substratum is composed of mottled, grayish-brown silty clay. Shale bedrock is at a depth of more than 4 ft. Permeability is slow, and the available water capacity is slow (USDA, 1981).

Er is found east of the west aircraft parking apron. These soils consist of deep, nearly level to moderately steep, moderately well-drained soils that have a compacted layer. These soils formed a colluvium that weathered from shale and sandstone. A typical soil profile is approximately 60 inches in depth. The surface layer is about 6 inches thick and is composed of very dark grey silt loam in the upper four inches and yellowish-brown silt loam in the lower 2 inches. The subsoil is approximately 54 inches thick and is composed of yellowish brown friable silt loam in the upper 16 inches. In the next 6 inches below there is a mottled, yellowish-brown, firm silty clay loam. In the lower 32 inches, which is a compacted layer, there exists a mottled, brown, very firm and brittle, silt loam. The substratum is composed of a mottled, brown silt loam. Permeability is slow and the available water capacity is moderate (USDA, 1981).

Gl is found in the central and southern portions of the Base. These soils consist of moderately deep, nearly level to very steep, well-drained soils on uplands. These soils formed in material that weathered from shale and fine-grained sandstone. A typical soil profile is approximately 31 inches in depth. The surface layer is about 5 inches thick. It is composed of very dark grayish-brown silt loam in the upper 2 inches and yellowish-brown silt loam in the lower 3 inches. The subsoil is yellowish-brown, friable shaly silt loam 18 inches thick. The substratum, approximately 8-inches thick, is yellowish-brown, friable, very shaly loam. Shale bedrock is at a depth of 31 inches. Permeability and the available water capacity is moderate (USDA, 1981).

GSF is found on the slope between the POL Storage Area at Site 7 and McClarens Run (Figure 3-3). These soils consist of a moderately deep, nearly level to very steep, well-drained soils on uplands. These soils formed in material that weathered from shale and fine-grained sandstone. A typical soil profile is approximately 31 inches in depth. The surface layer is about 5 inches thick. It is composed of very dark grayish-brown silt loam in the upper 2 inches and yellowish-brown silt loam in the lower 3 inches. The subsoil is composed of yellowish-brown, friable shaly silt loam approximately 18 inches thick. The substratum is composed of yellowish-brown, friable very shaly loam. Shale bedrock is at a depth of approximately 31 inches. Permeability and available water capacity are moderate (USDA, 1981).

GQF is a complex with very steep slopes of 25 to 80 percent and is located at the most southern end of the Base. The complex is composed of about 50 percent Gilpin soils, 15 percent Upshur soil, and 35 percent of other soils. The Upshur Soils are described as consisting of deep, gently sloping to very deep, well-drained soils on uplands. These soils formed in material that weathered from red clay shale bedrock. A typical soil profile is approximately 64 inches in depth. The surface layer is about 6 inches thick and is composed of dark reddish-gray silt clay loam. The subsoil is approximately 25 inches thick. It is composed of firm clay in the upper 20 inches and dusky-red, firm silty clay in the lower 5 inches. The substratum, approximately 31 inches thick, is composed of dusky red shaly silty clay and very shaly silty clay. Shale bedrock occurs at a depth of approximately 64 inches. Permeability is slow and the available water capacity is moderate (USDA, 1981).

None of the soils on the Base are designated as "Prime Farmlands" by the USDA. The At silt loam has been designated as farmland of statewide importance; however, these soils are only found in isolated areas along McClarens Run at the Base. Farming or grazing on Base property where these soils are located is impractical (Weston, 1984).

As indicated in Section 3.4, At is an alluvial soil on floodplains adjacent to streams. Approximately one to two acres of Base property can be considered to be floodplain (Weston, 1984).

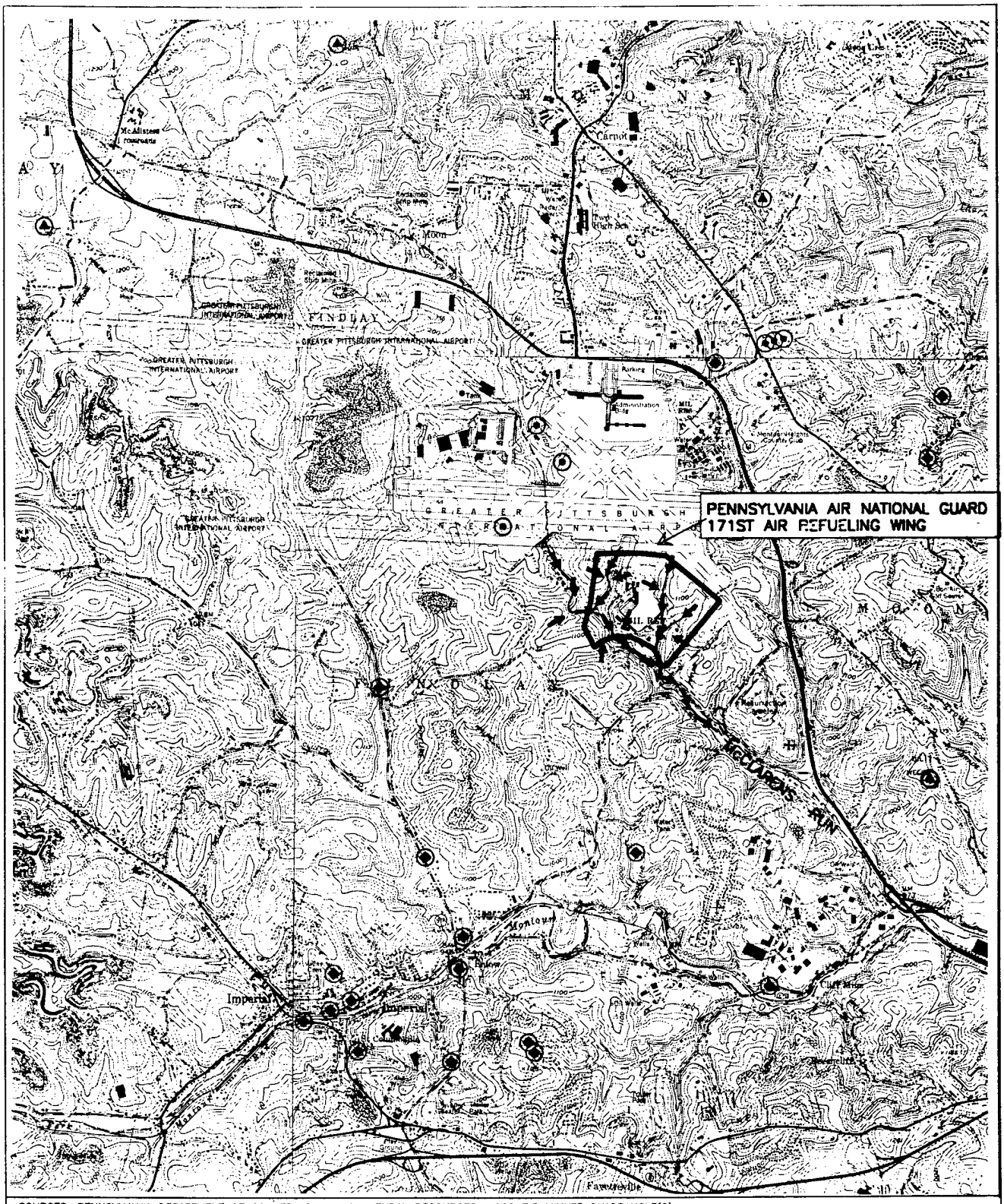
3.5 HYDROLOGY

The following discussions of surface hydrology and groundwater hydrology address respective regional and local hydrologic conditions.

3.5.1 Surface Water Hydrology

Allegheny County is drained and divided by three principal rivers: the Ohio, Monongahela, and Allegheny Rivers, and is subdivided by many other smaller waterways. The Ohio River is located roughly two miles north of the Pittsburgh IAP.

Drainage on Base is controlled by man-made ditches, culverts, and storm sewers which ultimately discharge into McClarens Run. McClarens Run, shown on Figure 3-4, flows in a southeasterly direction along the southwest side of the Base and joins Montour Run approximately 1.5 miles south of the airport boundary. Montour Run flows east then north,



SOURCES: PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES ,USGS 7.5 MINUTE QUADRANGLE(S) FOR ALIQUIPPA, CLINTON, AMBRIDGE AND OAKDALE, PENNSYLVANIA

LEGEND

- DIRECTION OF SURFACE WATER FLOW
- MONITORING/PIEZOMETER /TEST WELLS
- WATER SUPPLY (PUBLIC OR PRIVATE)
- UNDIFFERENTIATED

*NOTE: WELL LOCATIONS BASED ON AVAILABLE INFORMATION

SCALE 1:48,000

1 MILE 1/2 0

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC
VERTICAL DATUM OF 1929

N

FIGURE 3-4

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SURFACE HYDROLOGY AND WELL LOCATION MAP OF PENNSYLVANIA AIR NATIONAL GUARD PITTSBURGH INTERNATIONAL AIRPORT

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joining the Ohio River about five miles north of its confluence with McClarens Run. Surface drainage for the Base is shown on Figure 3-4. A relocated wetland exists between the east and west aircraft parking apron. Along with relocation of the wetland area, a storm water containment basin was constructed. The stream from the containment basin has an intermittent flow and corresponds to precipitation occurrences. No other surface water bodies exist on, or adjacent to, Base property.

3.5.2 Groundwater Hydrology

Groundwater in Allegheny County occurs in both unconsolidated alluvial deposits and bedrock formations. Groundwater is found in both artesian and water table aquifers (Gallaher, 1973). In 1973, there were over 600 permitted wells in Allegheny County (Weston, 1984). The major source of groundwater is alluvial deposits in floodplains, particularly along the Allegheny and Ohio Rivers. Sandstone and limestone bedrock are a minor source of groundwater. Wells drilled in bedrock generally yield only enough water for small domestic and farm needs (Weston, 1984). Hydrologic characteristics of the various geologic units are summarized in Table 3-2. Unconsolidated Quaternary-age alluvial deposits, which overlie the bedrock in major stream valleys, are generally permeable and yield moderate to large supplies of water to wells when saturated. Deposits along the Ohio River range from several hundred feet to a mile in width, and reach an average maximum thickness of 65 to 70 ft.

Locally, within overburden alluvium, groundwater may exhibit a vertical flow component into the weathered bedrock surface. The horizontal component typically flows toward small tributary streams and toward the Ohio River. Along the Ohio River valley, groundwater flows within the alluvium to the southeast, the same direction as the Ohio River flows.

Well yields from these deposits range from a few gallons per minute (gpm) to more than 3,000 gpm, with an average yield of 350 gpm (Weston, 1984). Well yields vary locally depending on the permeability and thickness of the saturated deposits penetrated by the well (Weston, 1984).

Data on selected wells within the local area of the Pittsburgh IAP are summarized in Table 3-4. The closest wells are approximately 1 mile or greater from the Base. Wells located within close proximity of the Base (listed on Table 3-4) are indicated on Figure 3-2. As would be expected, the largest yielding wells are located in alluvial deposits along the Ohio River. Wells drilled in bedrock supply small commercial, industrial, and domestic users.

The Moon Township Municipal Authority supplies the Base potable water through a contract with the County Department of Aviation. The water is obtained from alluvial deposits of sand and gravel in the floodplain of the Ohio River near Coraopolis, Pennsylvania. The water is pumped through one radial and two vertical wells to a 3.5 million gallon per day treatment plant for softening and removal of small quantities of iron and manganese (Weston, 1984).

During the ABB-ES site inspection of the motor pool (ABB-ES, 1991), four boreholes were drilled around the perimeter of the Base motor pool area for the installation of groundwater monitoring wells into the overburden soils. Although sporadic, isolated occurrences of groundwater were noted, no wells were installed because no discrete shallow subsurface aquifer reportedly exists in the area (ABB-ES, 1991).

Table 3-4 Well Location Data

Well #	Well Location Lat-Long	Owner	Altitude (AMSL)	Well Depth (ft)	Yield (gpm)	Use
23	402713-801444	James Nealis	1080	152	20	NA
27	402722-801400	Frank Messnios	1040	110	8	NA
28	402709-801210	Steve Krawchyk	900	162	12	NA
31	402830-801428	Alpha Cogar	1000	105	6	NA
32	402706-801438	E. Eberhardt	980	115	3	NA
37	402700-801454	Emil Gomla	960	55	250	NA
38	402703-801446	Richard Thomas	980	102	20	NA
95	402955-801231	F. McGartland	1080	75	NA	NA
101	402646-801402	NA	1120	NA	NA	NA
105	402712-801400	NA	1060	NA	NA	NA
261	402739-801310	NA	1120	NA	NA	NA
367	402929-801114	G. Rochanowski	1120	110	10	NA
373	402743-801413	Wushnic	1000	200	1	NA
382	402652-801336	NA	1060	NA	NA	NA
383	402652-801336	NA	1080	NA	NA	NA
480	402652-801436	J. Newman	940	151	3	NA
NA	403030-801624	Dan Mawzin	1080	155	4	Private water supply
NA	403118-801444	Durdum	1080	120	20	Private water supply
NA	402806-801113	E. Phillips	1100	55	10	Private water supply
NA	403000-801212	Astorino Blue Cross	1160	32	NA	Monitoring Well
NA	403000-801212	Astorino Blue Cross	1160	28	NA	Monitoring Well
NA	403000-801212	Astorino Blue Cross	1160	41	NA	Monitoring Well
NA	402914-801342	Pittsburgh Airport	1120	29	NA	Piezometer
NA	402942-901331	Pittsburgh Airport	1100	15	NA	Piezometer
NA	402930-801321	Pittsburgh Airport	1120	15	NA	Piezometer
NA	403040-801212	B. Bonham	1100	200	2.5	Private water supply

Sources: Pennsylvania Department of Conservation and Natural Resources (DNR) Well Map Inventory Data Files, January 1996; Pennsylvania Bureau of Topographic and Geological Survey May, January 1996; Pennsylvania DCNR Water Well Inventory Reports (dates vary).

Note: AMSL Above Mean Sea Level
NA Information Not Available

According to Act 2, Chapter 3, Section 2B, of the Land Recycling and Environmental Remediation Standards Act (Commonwealth of Pennsylvania, 1995), the PaDER "will consider groundwater to be an aquifer without further hydrogeologic study or evaluation if a developed spring or a typically constructed well is drilled in a formation or group of formations yields water year round in an amount greater than 200 gallons/day. For the purpose of applying the definition of aquifer in Act 2 to the Statewide Health Standard of Section 303(b)(3), the Department considers an aquifer used, in the absence of any specific information, if any drinking water or agricultural use exists within the area extent of the aquifer. Aquifers not actually used as defined above, will be considered by the Department to be currently planned for use when the aquifer may be used for drinking water or agricultural use with reasonable treatment. Aquifer usage determinations may be evaluated by utilizing hydrogeologic, geologic, and water resource reports published by the U.S. Geological Survey..."

Groundwater contained within the overburden soils occurring beneath the base was evaluated during the SI. The results of this study and the results of the site inspection of the motor pool (ABB-ES, 1991) shows that the overburden soils are relatively thin beneath the facility and contain only isolated, sporadic occurrences of groundwater. Act 2, Chapter 3, Section 2B of the Land Recycling and Environmental Remediation Standards Act states that for a groundwater zone to be considered an aquifer, a well installed into the water-bering zone should be able to sustain year round water yields of 200 gallons per day. Based on the sporadic occurrences of groundwater within the thin overburden soils, it is unlikely that a well installed into these soils could sustain year round withdrawals in amounts equal to, or greater than, 200 gallons per day. The results of this qualitative evaluation suggests that the overburden soils proximal to the 171st ARW do not have the potential to be considered an aquifer per Act 2, Chapter 3, Section 2B of the Land Recycling and Environmental Remediation Standards Act.

The Base originally had two bedrock wells which produced poor quality water with high iron content. In the 1970s, these wells were abandoned because of poor water quality (Weston, 1984). The wells remain but have been sealed with concrete. The Base purchased water from the county as a back-up supply, even when their own wells were producing.

3.6 CRITICAL HABITATS/ENDANGERED SPECIES

There are no known endangered species of birds or animals listed as native to Pennsylvania within a 50-mile radius of the Pittsburgh IAP (Weston, 1984). There are no known endangered species or critical habitats in the vicinity of the Base (Weston, 1984).

4.0 FIELD PROGRAM

The methods and procedures used to conduct the SI field effort at Site 7, 171st ARW of the Pennsylvania ANG, Coraopolis, Pennsylvania are presented in this section. The procedures for sampling soil gas, soil, surface sediment, and groundwater are discussed along with procedures for piezometer installation, soil boring abandonment, and Quality Control (QC) sample collection.

4.1 SUMMARY

Field activities conducted from October 31 to November 18, 1994, and August 23 to August 31, 1995, at Site 7 (the POL Storage Area and the Fuel Hydrant Pipeline) included both field screening and confirmational activities. SI field program activities followed the guidelines established in the WP (EARTH TECH, 1994) and WPA (EARTH TECH, 1995). Minor deviations from the WP and WPA made during the field effort are documented on Field Change Request forms, which are presented in Appendix A. The QC levels used for field and confirmation activities were Hazardous Waste Remedial Actions Program (HAZWRAP) Levels A through C QC protocols as summarized below, in accordance with "Requirements for Quality Control of Analytical Data (DOE/HWP 65/R1, July 1990a) and "Quality Control Requirements for Field Methods" (DOE/HWP 69/R1, July 1990b).

Level A: Field survey, using a Photoionization Detector (PID), of soil samples for safety considerations and preliminary field screening.

Level B: Field analytical screening of soil gas, soil, and groundwater samples to determine levels of Volatile Organic Compound (VOCs) using an on-site Gas Chromatograph (GC).

Level C: Collection and analysis by an off-site analytical laboratory of soil and sediment samples to determine levels of Benzene, Toluene, Ethylbenzene, Xylene (BTEX) and TPH.

A geologist was present during sampling activities to log samples, monitor installation operations, record soil data, and prepare boring logs. Field documentation procedures were followed in accordance with the WP (EARTH TECH, 1994). Field logs generated by the field activities are presented in Appendix B. Field activities are summarized in Table 4-1 and are described in detail in the following sections.

4.2 FIELD SCREENING ACTIVITIES

Field screening using the PID was conducted to identify high concentrations of contaminants present in soil samples for both safety considerations and as a preliminary soil screening. Field screening activities using the on-site GC were used to qualitatively delineate areas of possible contamination in Site 7 soils, to provide guidance for the placement of the confirmation soil borings, and to assist in the selection of confirmation soil samples for laboratory analyses.

Table 4-1 Summary of Site Investigation Activities
171st Air Refueling Wing, Pennsylvania ANG
Coraopolis, Pennsylvania

Location	Field Activities		Media Analysis
	Screening	Confirmation	SW-846 Methods
1994 POL Storage Area	· Screened soil samples with PID · Performed SOV survey · Collected 5 Geoprobe® soil samples · Collected 7 Geoprobe® groundwater samples · Installed 3 temporary piezometers	· Submitted 10 soil samples for laboratory analyses · Submitted 5 sediment samples for laboratory analyses	· BTEX (8240) · TPH-diesel (Modified 8015)
1994 Fuel Hydrant Pipeline	· Screened soil samples with PID · Performed SOV survey · Collected 4 Geoprobe® soil samples · Collected 7 Geoprobe® groundwater samples · Installed 3 temporary piezometers · Collected 1 piezometer groundwater sample	· Submitted 9 soil samples for laboratory analyses	· BTEX (8240) · TPH-diesel (Modified 8015)
1995 Fuel Hydrant Pipeline	· Screened soil samples with PID · Performed SOV survey · Collected 6 Geoprobe® soil samples · Screened confirmation soil samples with field GC	· Submitted 8 soil samples for laboratory analyses	· BTEX (8240) · TPH-diesel (Modified 8015) · TPH-gasoline (Modified 8015)

BTEX Benzene, Toluene, Ethylbenzene, and Xylenes
GC Gas Chromatograph
PID Photoionization Detector
SOV Soil Organic Vapor
TPH Total Petroleum Hydrocarbons

SW-846 refers to "Test Method for Evaluating Solid Waste - Physical/Chemical Methods," 3rd edition, November 1986.
Modified 8015 refers to "California Modified Method 8015."
Leaking Underground Fuel Tank (LUFT) Field Manual," State Water Resources Control Board, State of California, May 1988.

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Screening activities included a geophysical survey, a soil organic vapor (SOV) survey, soil and groundwater sample collection and on-site analysis using a GC, and installation of temporary piezometers. Table 4-2 summarizes the screening sample locations. Soil gas, groundwater, and soil screening sample collection and analysis activities were conducted by EnviroSurv, a firm subcontracted to EARTH TECH. On-site analytical methods are discussed in Section 4.2.6. Temporary piezometers were installed and water levels were measured to possibly assist in determining the direction of groundwater flow. All field screening activities were conducted according to the HAZWRAP QC Level A protocols for the PID and Level B protocols for the on-site GC(DOE/HWP-69/R1, 1990b).

For both the 1994 and 1995 field efforts, public utility and Base utility representatives were contacted to confirm the location of underground utilities.

4.2.1 Geophysics Survey

During the 1994 field effort, EARTH TECH personnel conducted a geophysical survey to identify and locate underground utilities, the fuel hydrant pipeline, and/or other structures present in the subsurface. The survey was completed prior to the advancement of any sampling devices into the soil. Two non-destructive geophysical instruments were used, a point-source magnetometer (i.e., a TW-6 metal detector) and groundwater penetrating radar (GPR). A TW-6 metal detector is a portable, hand-held transmitter-receiver type instrument. It was operated in the Inductive Locating Mode to locate the jet fuel pipeline and other metallic subsurface conductors, such as power and communication cables and natural gas lines. The GPR instrument used was the GSSI SIR System 3 Radar. A GPR survey grid with perpendicular traverses was established over the areas of interest, all GPR records were labeled, and the location of the grid lines were noted on the records. The GPR was used to locate a wide variety of subsurface utility lines such as water mains, sanitary and storm sewer lines, and a UST. Details of the geophysics survey are presented in Appendix C.

4.2.2 Soil Organic Vapor Survey

The SOV survey consisted of the collection and on-site field GC analysis of soil gas samples. Samples were collected using a truck-mounted hydraulic unit, and a Geoprobe® sampling system. Three ft lengths of 3/4-inch outer diameter (OD), hollow, steel pipe were driven to depths between 2 to 18 ft bgs by a Geoprobe® hydraulic hammer. Once the desired sampling depth was reached, the probes were withdrawn approximately 1 ft. This process detached the drive tip and allowed soil gas to enter the hollow rods. The below-ground end of each probe was fitted with a threaded valve and a Teflon® gasket. Polyethylene tubing was connected to the valve and to a sampling bulb and vacuum pump located inside the truck. The vacuum pump was used to actively draw soil gas into the tubing. The tubing assembly was purged of approximately 3 to 5 tubing volumes, typically 2 liters of air, prior to sample collection. A vacuum gauge monitored the vacuum level to ensure adequate gas flow from the vadose zone. The volume of air within the probe was purged by evacuating appropriate volumes of gas. Evacuation time in minutes versus the vacuum in inches of mercury was used to calculate the necessary evacuation time. Samples were then collected in glass bulbs fitted with Teflon® stopcocks and delivered to the on-site GC analyst. Soil gas was subsampled (duplicate injections) in volumes ranging from 1 μl to 2 ml, depending on the suspected VOC concentrations at any particular location.

Table 4-2 Field Sampling Summary
171st Air Refueling Wing, Pennsylvania ANG
Coraopolis, Pennsylvania

Sample ID	Matrix	Type	Depth (ft)
SG-1 (POL Facility)	Soil gas	Screening	5
SG-2 (POL Facility)	Soil gas	Screening	5
SG-3 (POL Facility)	Soil gas	Screening	15
SG-4 (POL Facility)	Soil gas	Screening	5
SG-5 (POL Facility)	Soil gas	Screening	5
SG-6 (POL Facility)	Soil gas	Screening	18
SG-7 (POL Facility)	Soil gas	Screening	12
SG-8 (POL Facility)	Soil gas	Screening	5
SG-10 (POL Facility)	Soil gas	Screening	8.5
SG-11 (POL Facility)	Soil gas / water	Screening	9 / 5
SG-12 (POL Facility)	Soil gas / soil	Screening	5, 10 ,15 / 8-9
SG-14 (POL Facility)	Soil	Screening	0.5 - 1.5
SG-15 (POL Facility)	Soil gas / water	Screening	9 / 8
SG-16 (POL Facility)	Soil gas / water	Screening	5 / 2
SG-17 (POL Facility)	Soil gas / water	Screening	10 / 9
SG-18 (POL Facility)	Soil gas	Screening	5, 10
SG-19 (POL Facility)	Soil gas / water	Screening	9 / 8
SG-20 (POL Facility)	Soil gas / soil	Screening	5, 10
SG-22 (POL Facility)	Soil gas	Screening	9
SG-24 (POL Facility)	Soil gas	Screening	6
SG-25 (POL Facility)	Water	Screening	4
SG-26 (POL Facility)	Soil gas	Screening	9
SG-29 (POL Facility)	Soil	Screening	0.5 - 1.5
SG-30 (POL Facility)	Soil	Screening	0.5 - 1.5
SG-31 (POL Facility)	Soil gas	Screening	6
SG-32 (POL Facility)	Soil gas	Screening	7.5
SG-33 (POL Facility)	Soil gas	Screening	5
SG-34 (POL Facility)	Soil gas	Screening	5
SG-35 (Fuel Hydrant Pipeline)	Soil gas / water	Screening	8.5 / 5
SG-36 (Fuel Hydrant Pipeline)	Soil gas	Screening	5
SG-37 (Fuel Hydrant Pipeline)	Soil	Screening	5 - 7
SG-38 (Fuel Hydrant Pipeline)	Soil gas	Screening	7
SG-39 (Fuel Hydrant Pipeline)	Soil gas	Screening	5
SG-40 (Fuel Hydrant Pipeline)	Soil gas	Screening	3
SG-41 (Fuel Hydrant Pipeline)	Soil gas	Screening	10

Table 4-2 (continued)

Sample ID	Matrix	Type	Depth (ft)
SG-42 (Fuel Hydrant Pipeline)	Soil gas	Screening	8
SG-43 (Fuel Hydrant Pipeline)	Soil gas / water	Screening	5, 10, 13 / 11
SG-44 (Fuel Hydrant Pipeline)	Soil gas	Screening	5.5
SG-45 (Fuel Hydrant Pipeline)	Soil gas / water	Screening	5.5 / 3.8
SG-46 (Fuel Hydrant Pipeline)	Soil gas	Screening	5
SG-47 (Fuel Hydrant Pipeline)	Soil gas	Screening	12
SG-48 (Fuel Hydrant Pipeline)	Soil gas	Screening	7.5
SG-49 (Fuel Hydrant Pipeline)	Soil gas	Screening	7
SG-50 (Fuel Hydrant Pipeline)	Soil gas / water	Screening	9 / 3 and 4.8
SG-51 (Fuel Hydrant Pipeline)	Soil gas	Screening	5, 9.5
SG-52 (Fuel Hydrant Pipeline)	Soil	Screening	10 - 11
SG-53 (Fuel Hydrant Pipeline)	Soil gas / soil	Screening	6 / 5-7
SG-54 (POL Facility)	Soil gas	Screening	12
SG-55 (POL Facility)	Soil gas	Screening	12
SG-56 (POL Facility)	Soil gas	Screening	10
SG-57 (POL Facility)	Soil gas / water	Screening	9 / 4
SG-58 (POL Facility)	Soil gas	Screening	4
SG-59 (Fuel Hydrant Pipeline)	Soil gas	Screening	6
SG-60 (Fuel Hydrant Pipeline)	Soil gas / water	Screening	5 / 5
SG-61 (Fuel Hydrant Pipeline)	Soil gas / water	Screening	9 / 5
SG-62 (Fuel Hydrant Pipeline)	Soil gas	Screening	5, 10, 15
SG-63 (Fuel Hydrant Pipeline)	Soil gas	Screening	5, 10, 15
SG-64 (Fuel Hydrant Pipeline)	Soil gas	Screening	5, 10, 15, 18
SG-65 (Fuel Hydrant Pipeline)	Soil gas	Screening	10, 15
SG-66 (Fuel Hydrant Pipeline)	Soil gas	Screening	5, 9
SG-67 (Fuel Hydrant Pipeline)	Soil gas	Screening	
SG-68 (Fuel Hydrant Pipeline)	Soil gas	Screening	5
SG-69 (Fuel Hydrant Pipeline)	Soil gas	Screening	10, 15
SG-70 (Fuel Hydrant Pipeline)	Soil gas	Screening	15
PZ-5 (Fuel Hydrant Pipeline)	Water	Screening	3
SB-1 (POL Facility)	Soil	Confirmation (of SG-54)	4-6, 9-11
SB-2 (POL Facility)	Soil	Confirmation (of SG-20)	3-5, 7-9
SB-3 (POL Facility)	Soil	Confirmation (of SG-14)	0-1

Table 4-2 (continued)

Sample ID	Matrix	Type	Depth (ft)
SB-4 (POL Facility)	Soil	Confirmation (of SG-25)	3-5
SB-5 (POL Facility)	Soil	Confirmation (of SG-15)	3-5
SB-6 (POL Facility)	Soil	Confirmation (of SG-57)	3-5, 7-9
SB-7 (Fuel Hydrant Pipeline)	Soil	Confirmation (of SG-42)	5-7
SB-8 (Fuel Hydrant Pipeline)	Soil	Confirmation (of SG-43)	9-11
SB-9 (Fuel Hydrant Pipeline)	Soil	Confirmation (of SG-44)	3-5
SB-10 (Fuel Hydrant Pipeline)	Soil	Confirmation (of SG-45)	3-5
SB-11 (Fuel Hydrant Pipeline)	Soil	Confirmation (of SG-51)	3-5, 7-9
SB-12 (Fuel Hydrant Pipeline)	Soil	Confirmation (of SG-50)	3-5, 7-9
SB-13 (Fuel Hydrant Pipeline)	Soil	Confirmation (of SG-49)	4-6
SB-14 (Fuel Hydrant Pipeline)	Soil	Confirmation (of SG-29)	2-4
SB-15 (Fuel Hydrant Pipeline)	Soil	Screening/ Confirmation	1-3, 3-5, 5-7, 9-11, 11-13 / 3-5
SB-16 (Fuel Hydrant Pipeline)	Soil	Screening/ Confirmation	3-5, 6.5-8.5 / 3-5, 6.5-8.5
SB-17 (Fuel Hydrant Pipeline)	Soil	Screening/ Confirmation	3-5,7-9, 11-13 / 3-5, 7-9
SB-18 (Fuel Hydrant Pipeline)	Soil	Screening/ Confirmation	3-5, 7-9, 12-12.5 / 3-5, 12-12.5
SB-19 (Fuel Hydrant Pipeline)	Soil	Screening/ Confirmation	3-5 / 3-5
SB-20 (Fuel Hydrant Pipeline)	Soil	Screening	3-5, 7-9, 11-13
SB-21 (Fuel Hydrant Pipeline)	Soil	Screening	3-5, 6.5-8.5, 12-14

Copies of the SOV survey reports are presented in Appendix D. SOV survey findings are discussed in Section 6.0, Investigation Findings.

Soil Gas Sampling - 1994 Field Effort

Fifty soil gas locations, of which 25% were to include vertical profile sampling, were proposed in the WP (EARTH TECH, 1994). Vertical profile sampling involves collecting multiple samples at different depths bgs from the same boring, i.e., at target depths of 5 ft, 10 ft, and 15 ft. If refusal was encountered before reaching the target depth, a sample was collected. During the SI field work, 56 soil gas samples were collected from 49 locations. Five soil gas locations were sampled as vertical profiles including 5 vertical profiles (SG-12 at 5, 10, and 15 ft bgs; SG-18 and SG-20 at 5 and 10 ft bgs; SG-43 at 5, 10, and 13 ft bgs; and SG-51 at 5 and 9.5 ft bgs). Either the bedrock was too shallow for deeper sampling depths or the formation permeability was too low for the extraction of soil gas. Figures 4-1 and 4-2 identify the sampling locations. The rationale for the deviations from the WP is discussed below.

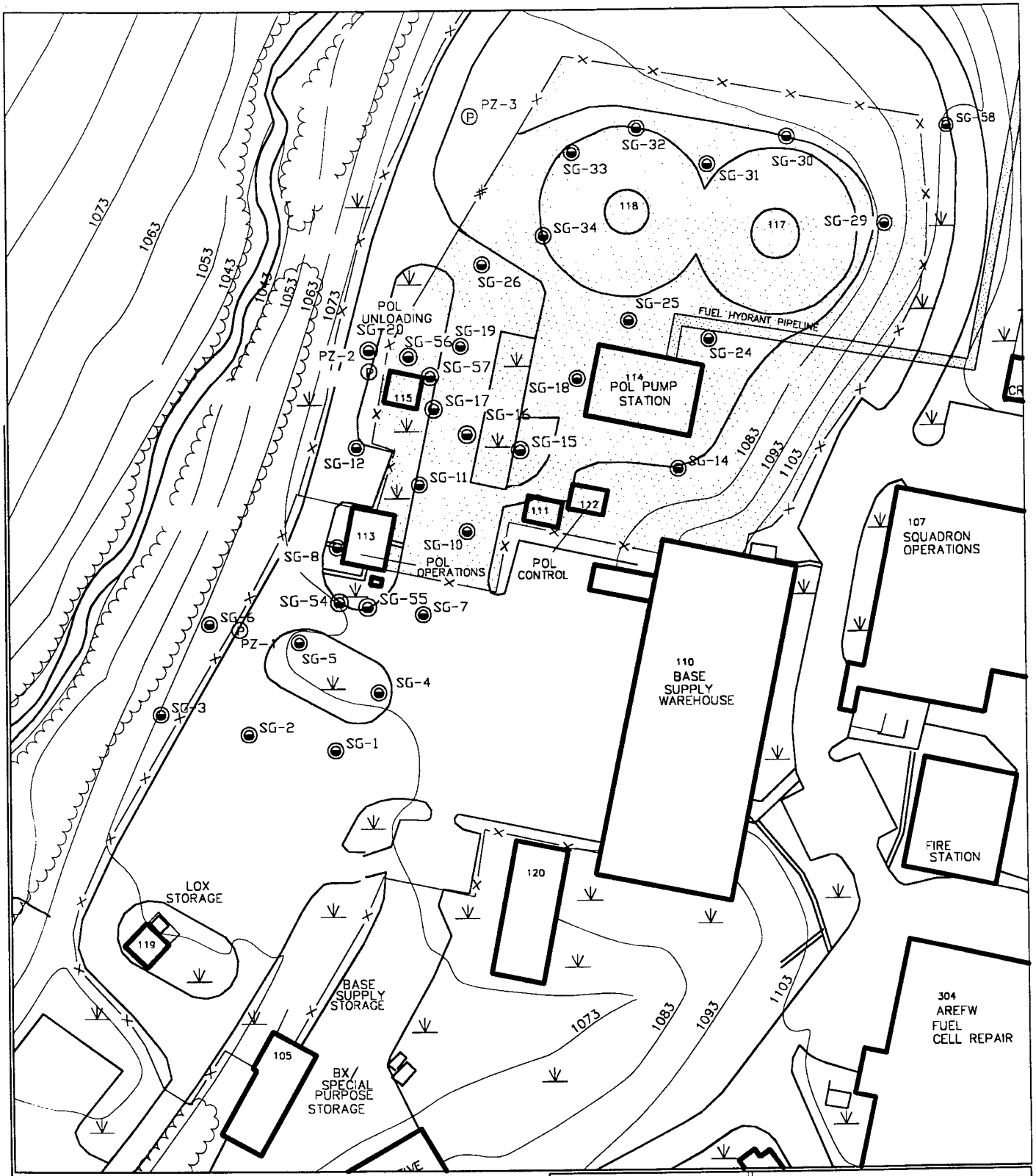
Five of the original 50 soil gas points were relocated (SG-54 through SG-58). The original sampling points were topographically down-gradient from the POL Storage Area. Soil gas samples collected between the five original points and the POL Storage Area did not indicate any contamination; therefore, the five topographically down-gradient locations were omitted. The resulting five soil gas points were relocated to screen other locations in the POL Storage Area.

Six additional soil gas points (SG-51 through SG-53 and SG-59 through SG-61) were added along the Fuel Hydrant Pipeline. Three of these five points (SG-51, 52, and 59) were located topographically down-gradient of soil gas points where contaminants had already been detected. The other two points (SG-60 and SG-61), at the request of the Base, were located in an area of proposed construction located at the end of the pipeline.

Low permeability encountered in five of the locations made soil gas extraction difficult or impossible. Instead, soil samples for QC Level B (DOE/HWP 65/R1, July 1990) screening samples were collected from locations SG-14, SG-29, SG-30, SG-37, and SG-52, as shown on Figures 4-1 and 4-2. In another of the locations designated for a soil gas samples, SG-25, the soil was saturated, precluding the possibility of extracting any vapors from this area. Instead, a water sample was collected here. Additionally, the bedrock was too shallow for either the collection of a soil gas or soil sample in the proposed soil gas sample location SG-09 and no water was present; therefore, no sample was collected.

Soil Gas Sampling - 1995 Field Effort

A total of 14 soil gas samples (6 of which were optional) from 10 locations (4 of which were optional) were proposed for screening (EARTH TECH, 1995). Soil gas samples were subsequently collected from eight of nine sampling locations (SG-62 through SG-66 and SG-68 through SG-70). Soil of low permeability was present at SG-67; therefore, no soil gas sample was collected. A total of 18 soil gas samples were collected and screened on-site (Figure 4-2). These sampling points were located at the end of the Fuel Hydrant Pipeline, off of Hydrant Pit 5, in an area where construction of a fuel test cell building is planned.



LEGEND

- SITE BOUNDARY
- 37 BUILDING AND NUMBER
- FENCE
- ROAD
- GRASS
- TREES
- SG-11 SOIL SCREENING LOCATION
- PZ-2 PIEZOMETER LOCATION
- 1103 TOPOGRAPHIC CONTOUR
- CONTOUR INTERVAL 10'

0 50 100 FEET

N

FIGURE 4-1

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – POL STORAGE AREA SCREENING LOCATIONS PENNSYLVANIA AIR NATIONAL GUARD PITTSBURGH INTERNATIONAL AIRPORT

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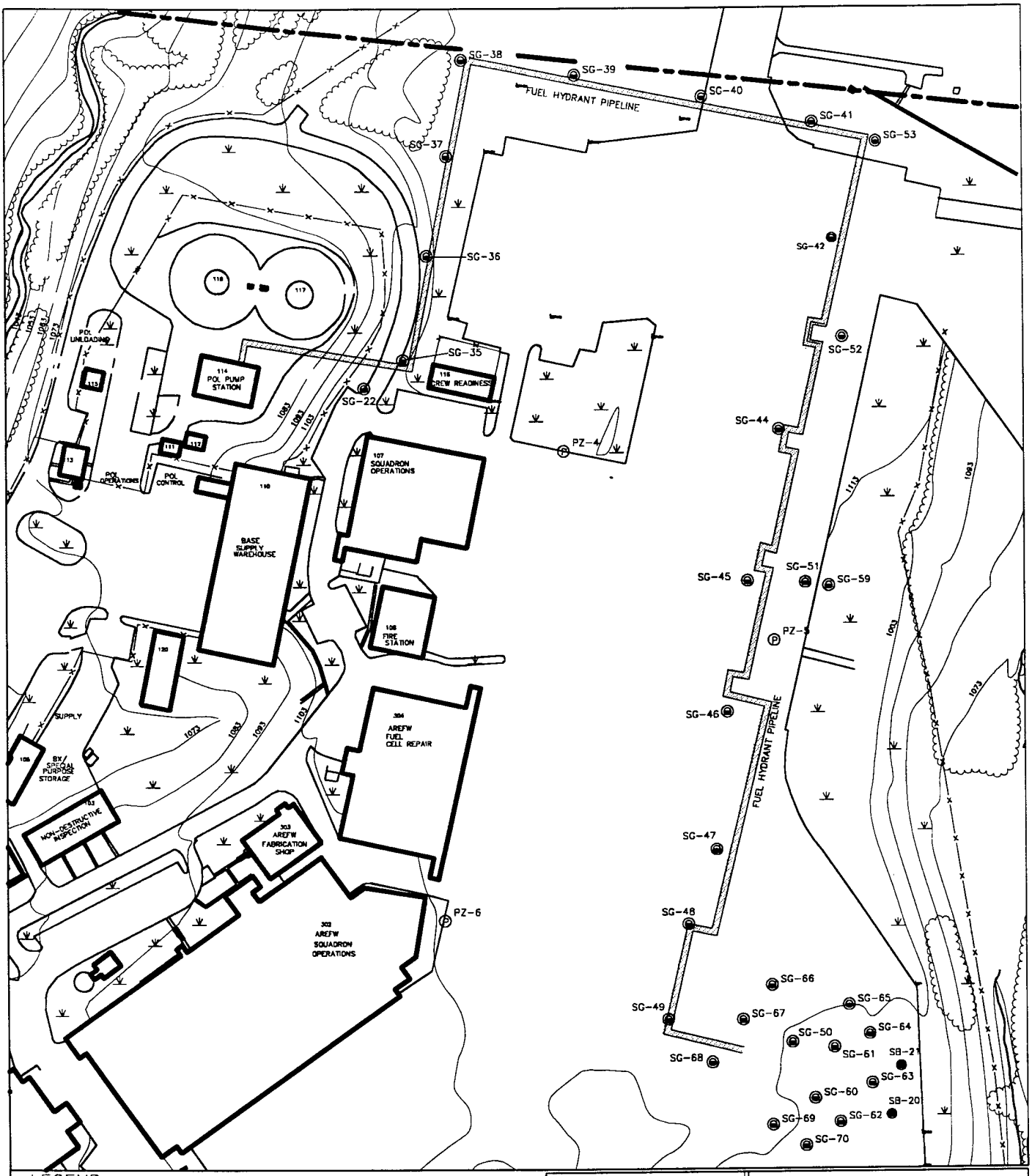


LEGEND

- ANG BOUNDARY
- SITE BOUNDARY
- 37 BUILDING AND NUMBER
- FENCE
- ROAD
- GRASS
- TREES
- 1103 TOPOGRAPHIC CONTOUR, CONTOUR INTERVAL 10'
- SG-2 SOIL GAS AND/OR SOIL SCREENING LOCATIONS
- SB-21 SOIL BORING LOCATIONS
- PZ-6 PIEZOMETER LOCATIONS

0 90 180 FEET

N

FIGURE 4-2

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – FUEL HYDRANT PIPELINE SCREENING LOCATIONS
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT

1/96

PFIG6-02.DWG 10/95

4.2.3 Piezometer Installation

On November 12, 1994 six temporary piezometers (PZ-1 through PZ-6) were installed using the truck-mounted Geoprobe® hydraulic sampling unit. Three piezometers, PZ-1, PZ-2, and PZ-3 were located within the POL Storage Area (Figure 4-1). Piezometers PZ-4, PZ-5, and PZ-6 were located along the Fuel Hydrant Pipeline (Figure 4-2). Once the holes were bored using 3/4-inch outer diameter (OD) steel rods, 1/4-inch polyvinyl chloride (PVC) screen and casing were lowered into the resulting borehole. The depth to groundwater was measured using an electronic water level indicator three days after the piezometers had been installed, allowing time for water levels to stabilize. Subsequent to the measuring of the water levels, the piezometers were abandoned by pulling the piezometer casing and filling the borehole with granular bentonite. The refusal depths, surface elevations, and bedrock elevations for the six temporary piezometers are summarized in Table 6-1 in Section 6. The measured water levels, surface elevations, and water level elevations for the six piezometers are included in Table 6-2 in Section 6.

One groundwater sample was collected from piezometer PZ-5 and screened using the on-site GC according to the analytical method discussed in Section 4.2.6.

4.2.4 Groundwater Screening

Groundwater samples were collected using the Geoprobe® hydraulic sampling unit used for soil gas sampling. The Geoprobe® unit was used to drive a 3/4-inch OD steel rod to the selected sampling depth. The rods were withdrawn from the borehole and PVC screen and casing were installed in the resulting borehole. Samples were collected via an inertia pump method, using dedicated polyethylene tubing equipped with a reusable stainless steel check valve. The tubing was raised and lowered above the screen section until a minimum of three tubing volumes had been purged. In some cases, the aquifer did not recharge sufficiently to purge three volumes. In these situations, whatever water that could be extracted was collected. This pumping method did not aerate the groundwater and therefore, was appropriate for analyses of VOCs. The tubing was withdrawn from the rods and the water remaining in the tubing was poured into 40-ml glass vials with Teflon®-lined caps. The vials were immediately delivered to the on-site GC analyst. The methods used to analyze the groundwater screening sample are discussed in Section 4.2.6.

Groundwater Sampling - 1994 Field Effort

The collection of 16 groundwater samples was proposed in the WP (EARTH TECH, 1994). Eight of these samples were proposed to be collected from soil gas points and eight were proposed to be collected from soil sampling locations. The field program deviated from the WP in that 14 groundwater samples were collected from soil gas locations and one sample was collected from a piezometer (Figures 4-1 and 4-2). Deviations from the WP are discussed below.

Nine groundwater samples were to be collected from the POL Storage Area. Due to extraction problems, two of the sample locations were deleted and proposed sampling locations were adjusted. A total of seven groundwater samples were collected in the POL Storage Area and analyzed on-site.

Seven groundwater samples were to be collected along the Fuel Hydrant Pipeline. A total of eight groundwater samples, including the one collected from piezometer PZ-5, were collected from along the fuel pipeline and analyzed on-site.

Groundwater Sampling - 1995 Field Effort

The collection of groundwater samples was proposed in the WPA (EARTH TECH, 1995) provided groundwater was encountered. However, since no saturated soils were encountered, no groundwater samples were collected for screening.

4.2.5 Soil Screening

Soil screening was conducted using the Geoprobe® sampling system which is similar to that used for collection of soil gas and groundwater samples. Soil screening samples were either collected in 4 six-inch long stainless steel liners or an acetate liner fitted within a 1.5-inch wide by 2-ft long piston soil sampler. These liners facilitate easy sample removal and visual examination of the ends of the sleeves. The soil sampler was driven in a manner similar to the SOV probes. When the top of the sample interval was reached, a reverse threaded screw, which holds the drive-point in position, was loosened and removed to allow the soil to enter the sample barrel as it was driven to the end of the sampling interval. Immediately upon retrieval, the sample barrel was opened, the end of the leading stainless steel liner was screened using a PID meter, and the reading recorded. A field screening soil sample was collected from the end of the bottom stainless steel liner, or a composite of all the soil in the acetate liner, and placed in a pre-cleaned 40-ml vial for on-site GC analysis. Vials were filled so that there was as little air space as possible, sealed air tight, and hand delivered to the on-site GC analyst. The analytical methods used to screen the soil samples are discussed in Section 4.2.6.

Soil Screening - 1994 Field Effort

Nine soil samples were collected for screening (Figures 4-1 and 4-2) although 36 samples were proposed in the WP (EARTH TECH 1994). One of the original purposes of the soil screening was to select the locations of the Level C soil samples. Because of the close proximity of the soil gas sample points in the SOV survey and the fact that bedrock was shallow in several areas, the Level B screening of confirmation soil samples was determined to be unnecessary and deleted from the field program. Subsequently, samples for screening were collected from locations where the soil permeability was too low for the collection of soil gas. In addition, a soil sample for Level B screening was collected adjacent to a soil gas point to support the results for the soil gas analysis.

Soil Screening - 1995 Field Effort

The 1995 SOV survey results were used to select the location of Level C soil samples. Twenty soil samples from seven locations (Figure 4-2) at the end of the fuel pipeline were collected for Level B screening although four samples from two locations were proposed in the WPA (EARTH TECH, 1995). Samples from five of these locations were collected as confirmation samples and screened on-site to determine which samples would be submitted for laboratory analyses. Four locations for Level C soil sampling (SB-15 through SB-18) were

selected around the perimeter area. A fifth location (SB-19) was selected at SG-67 where soils were not permeable enough to collect soil gas data. Samples were collected using stainless steel liners for potential Level C analysis alternating with acetate liners for Level B screening only. All samples were screened to obtain a vertical profile in addition to determining which of the samples would be shipped for confirmation analyses. Upon completion of the on-site GC analysis it was determined that two additional soil screening locations were necessary to further delineate possible soil contamination. The sampling points (SB-20 and SB-21) were located by stepping out 27 ft east from SB-15 and 40 ft southeast from SG-64, respectively (Figure 4-2). Soil samples were collected and analyzed using the on-site GC.

4.2.6 On-Site Analytical Methods

Target compounds for soil screening using the on-site GC are listed in Table 4-3 along with their approximate detection limits. The detection limit for each of the compounds is dependent upon the sensitivity of the detector to the individual compound as well as the volume of the injection. The mobility of BTEX makes them good indicators of contaminant migration at sites with potential fuel contamination.

Table 4-3 Screening Target Compounds and Quantitation Limits
171st Air Refueling Wing, Pennsylvania ANG
Coraopolis, Pennsylvania

	Quantitation Limits		
	Soil-gas (ppm)	Water (ppb)	Soil (ppb)
Benzene	0.50	2.0	2.0
Toluene	0.50	2.0	2.0
Ethylbenzene	0.50	2.0	2.0
Total Xylenes	1.0	2.0	5.0
Total JP-4 Volatiles	20.0	25.0	50.0
trans-1,2-DCE	0.1	2.0	2.0
cis-1,2-DCE	0.1	2.0	2.0
1,2-DCA	0.1	2.0	2.0
TCE	0.01	0.2	0.2
PCE	0.01	0.0	0.2

trans-1,2-DCE trans-1,2-dichloroethene
cis-1,2-DCE cis-1,2-dichloroethene
1,2-DCA 1,2-dichloroethane
TCE trichloroethene
PCE tetrachloroethene

ppm parts per million
ppb parts per billion

All samples collected for on-site analysis were analyzed using a Shimadzu 14A laboratory-grade GC equipped with both an electron capture detector and flame-ionization detector. Three-point calibrations were performed to ensure analyses for the target analytes were within the linear range of the analytical equipment. The instrument calibrations were checked periodically throughout each day to monitor the response factor and retention time. All field screening protocols and analytical results are included in EnviroSurv's report in Appendix D. Analytical results are discussed in Section 6.0 - Investigation Findings.

4.3 CONFIRMATION ACTIVITIES

Confirmational activities consisted of soil and sediment sample collection and chemical analyses by a laboratory as described in the following subsections. Locations of the confirmational soil samples were based upon the screening results.

4.3.1 Subsurface Soil Sampling

Subsurface soil sampling locations, as well as selection of samples submitted for confirmation laboratory analyses, were based on field screening results. Subsurface soil samples were collected in the same manner as the soil screening samples, described in Section 4.2.5. Four 6-inch long stainless steel liners were placed in each sampler and contain each soil sample. The four liners were wrapped and held together with PVC sheeting. Each sample was driven to the required depth, retrieved, opened, and the stainless steel liners removed. The PVC over-wrap was removed and the ends of the liners, those which were three-quarters or more full, were immediately sealed with Teflon® sheeting and PVC caps. For screening purposes the soil from the sampling shoe or bottom liner was placed in 40-ml vials for on-site GC analysis. The liners were then labeled according to the WP (EARTH TECH, 1994) and stored at approximately 4°C in a cooler filled with bagged ice. The cooler was shipped to the laboratory at the end of the current day or the following day. Soils were visually examined and lithologies logged according to the Unified Soil Classification System (USCS).

An example of a soil sample identification number is PS7-SB1-0203. PS7 is the location identifier (Pittsburgh, Site 7), SB-11 is the soil boring number, and 0203 identifies the depth at which the sample was collected (2 to 3 ft bgs). The resulting borings were subsequently filled with hydrated granular bentonite. If the borings were located on asphalt pavement they were capped with asphalt. At the request of the Base, a high-strength concrete patch was used for capping-off the borings located on the flight line and the concrete areas in the POL Storage Area.

Because of the shallow depth to bedrock, a hand auger was used to collect the soil sample from soil boring SB-03. The soil sample collected with the hand auger was immediately transferred to glass containers with Teflon®-lined caps, labeled, and placed in an iced cooler. Additional sample handling procedures were performed in accordance with the WP (EARTH TECH, 1994).

Subsurface Soil Sampling - 1994 Field Effort

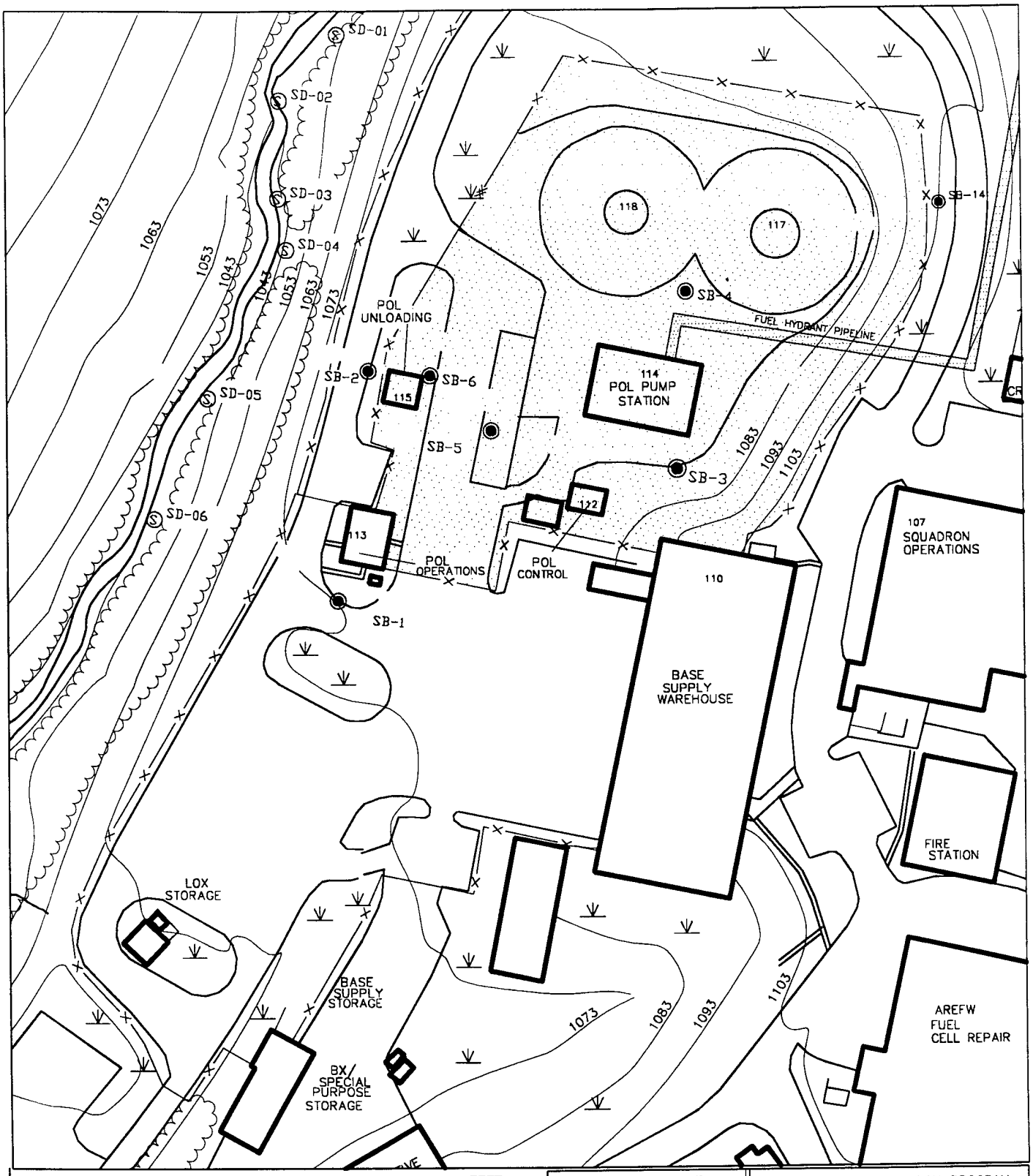
During the 1994 field effort 24 soil samples were proposed to be collected according to the WP (EARTH TECH, 1994) from 12 locations, two samples per location. Five of these sample locations were in the POL Storage Area, the other seven locations were along the fuel line. A total of 19 soil samples from 14 locations (SB-01 through SB-14) were subsequently collected and submitted for Level C analysis (Figures 4-3 and 4-4). Ten soil samples from seven locations (SB-01 through SB-06 and SB-14) were collected from the POL Storage Area (see Figure 4-3). In some of the locations, bedrock was encountered around 5 ft; therefore, the second sampling interval could not be collected as proposed. Nine soil samples from seven locations were collected along the Fuel Hydrant Pipeline (SB-07 through SB-13) (Figure 4-4). In most of the locations, bedrock was encountered at a depth of less than 10 ft; therefore, at these locations only one sample could be collected.

Subsurface Soil Sampling - 1995 Field Effort

No confirmation soil samples were proposed in the WPA for the 1995 field effort (EARTH TECH, 1995). However, the Base determined that soil samples were needed to confirm the screening data and to determine if contaminants were present in the proposed construction area. Subsequently, 20 subsurface soil samples were collected from seven sampling locations (SB-15 through SB-21) and screened using the on-site GC. Based on the screening results, eight samples from 5 locations, SB-15 through SB-19, were subsequently submitted to the laboratory for analyses.

4.3.2 Sediment Surface Sampling

Sediment samples were collected in 1994 from 0 to 6 inches bgs from McClarens Run at six locations topographically down-gradient of the Site 7 - POL Storage Area. Figure 4-3 presents surface sediment sampling locations (SD-1 through SD-6). Sediment samples were collected using either a 3-inch diameter stainless-steel hand auger or a stainless-steel trowel (Table 4-4). Sample collection activities followed the procedure described in the WP (EARTH TECH, 1994). If leaves were present at the sample point, the sample location was cleared prior to sampling. After collection, the samples were placed into 4-oz amber glass jars with Teflon®-lined lids and placed in an iced cooler. An example of a sediment sample identification number is P57-SD01. PS7 is the location identifier (Pittsburgh, Site 7) and SD01 indicates the sample is a sediment sample collected from location number 1.



LEGEND

- SITE BOUNDARY
- BUILDING AND NUMBER (37)
- FENCE
- ROAD
- GRASS
- TREES
- 1103 TOPOGRAPHIC CONTOUR, CONTOUR INTERVAL 10'
- SB-2 SOIL BORING LOCATION
- SD-06 SEDIMENT SAMPLE LOCATION

0 50 100 FEET

N

FIGURE 4-3

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – POL STORAGE AREA CONFIRMATION LOCATIONS PENNSYLVANIA AIR NATIONAL GUARD PITTSBURGH INTERNATIONAL AIRPORT

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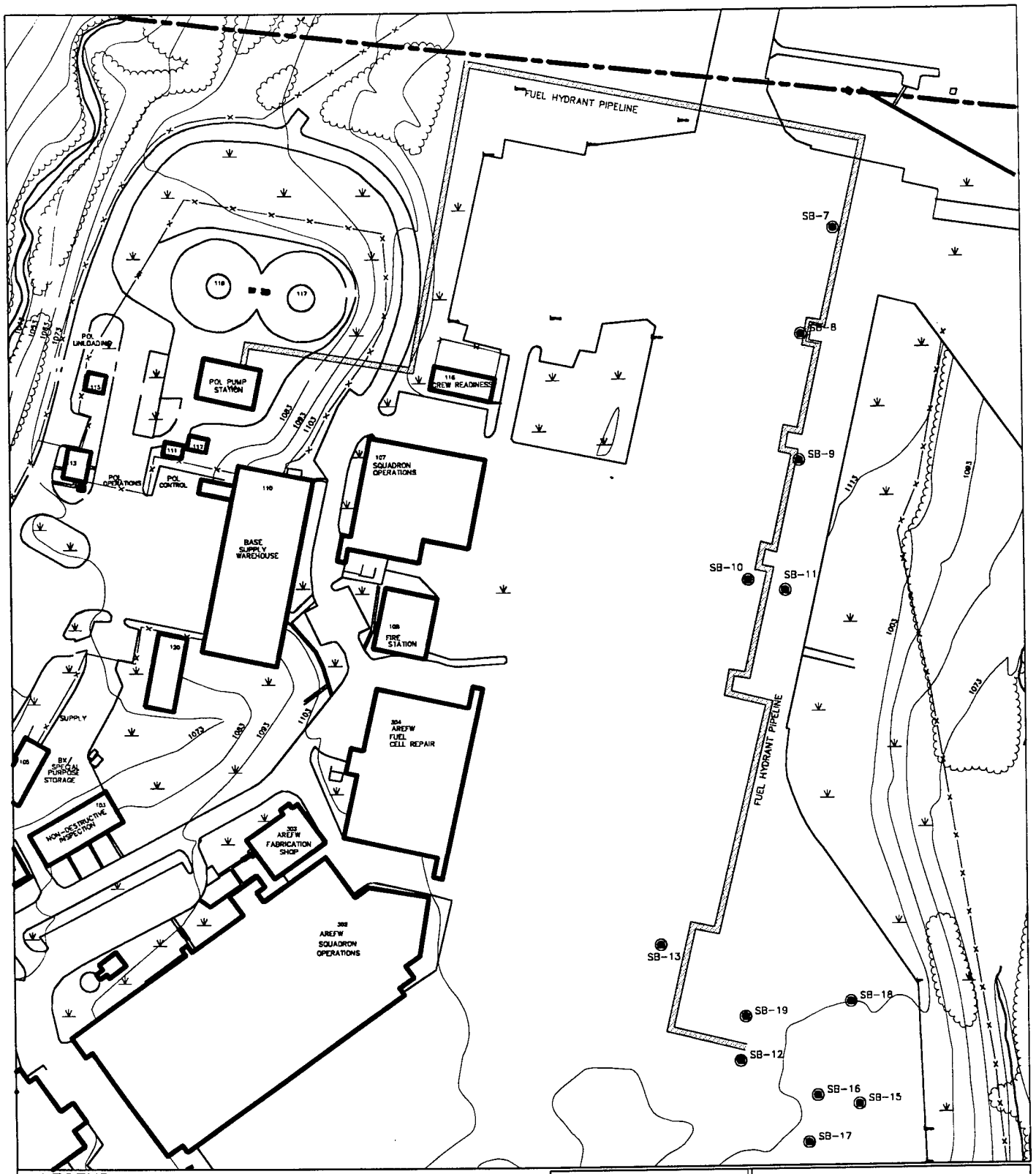

LEGEND

- ANG BOUNDARY
- SITE BOUNDARY
- 37 BUILDING AND NUMBER
- FENCE
- ROAD
- GRASS
- TREES
- 1103 TOPOGRAPHIC CONTOUR, CONTOUR INTERVAL 10'
- SB-16 SOIL BORING LOCATION

0 90 180 FEET

FIGURE 4-4

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – FUEL HYDRANT PIPELINE CONFIRMATION LOCATIONS
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT

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Table 4-4 Sediment Sample Location and Collection Method
171st Air Refueling Wing, Pennsylvania ANG
Coraopolis, Pennsylvania

Sediment Sample Number	Sample Location	Sample Collection Method
PS7-SD01	Creek Bank	Stainless-Steel Auger
PS7-SD02	Creek Bed	Stainless-Steel Trowel
PS7-SD03	Creek Bed	Stainless-Steel Trowel
PS7-SD04	Creek Bank	Stainless-Steel Auger
PS7-SD05	Creek Bank	Stainless-Steel Trowel
PS7-SD06	Creek Bed	Stainless-Steel Trowel
PS7-SD07*	Creek Bank	Stainless-Steel Auger

* Duplicate of PS7-SD01

4.3.3 Analytical Program

Selected confirmation soil and sediment samples collected from Site 7 in 1994 were submitted to CompuChem Environmental Corp. Selected confirmation soil samples collected from Site 7 in 1995 were submitted to Inchcape Testing Services. Laboratory analyses included BTEX using the U.S. Environmental Protection Agency (EPA) SW-846 (EPA 1986) Method 8240 and TPH (both purgable and extractable) using California Modified Method 8015. The 1994 samples were analyzed for TPH diesel-extractable while the 1995 samples were analyzed for both TPH diesel-extractable and gasoline-purgable. The laboratory failed to run TPH gasoline-purgable analyses on the 1994 samples and the oversight was not discovered until the sample holding time had elapsed.

Five trip blanks, 3 field blanks, 4 equipment rinseates, 3 duplicate soil samples, and 1 duplicate sediment sample were collected as QC samples. The samples were collected and analyzed using the same standard operating procedure and methods as those used for the environmental samples. Water samples which were to be analyzed for BTEX and TPH were preserved with hydrochloric acid to a pH of less than 2. The Quality Assurance/QC evaluation is included in Appendix E. All confirmation analytical laboratory results and the validation summaries are presented in Appendix F.

4.4 DECONTAMINATION PROCEDURES

Two separate decontamination procedures were used during the 1994 and 1995 field efforts. One procedure was used for the decontamination of sampling equipment. Sampling equipment was considered anything that could potentially touch the soil sample and included the sampler, the sampler shoe, and the sampler pin, as well as the hand auger. Sample equipment decontamination consisted of the following steps: 1) wash equipment with potable

water and a laboratory grade detergent (Liqui-nox®), 2) rinse using potable water, 3) rinse using deionized American Society for Testing and Materials (ASTM) Type II deionized (DI) water, 4) rinse using pesticide-grade methanol rinse, 5) air dry.

The second procedure was used to decontaminate Geoprobe® rods. Decontamination of the rods consisted of the following steps: 1) wash with potable water and a laboratory grade detergent (Liqui-nox®), 2) rinse using potable water, 3) air dry. During the 1995 field effort, the Geoprobe® unit and rods were decontaminated using a steam cleaner prior to, and at the conclusion of, the sampling activities.

The stainless steel liners for soil sampling were pre-cleaned; however, they were washed with potable water and Liqui-nox® and rinsed with ASTM Type II DI water.

4.5 INVESTIGATION-DERIVED WASTE MANAGEMENT

During the 1994 field effort, approximately 0.2 cubic feet of soil (contained in a 5-gallon pail) and three drums (containing approximately 120 gallons) of purged groundwater and decontamination water were generated during the investigation. A composite sample of the purge and decontamination water was collected from the three drums and submitted to the confirmation laboratory for Level C analyses of BTEX (SW-846 Method 8240) and TPH (California Modified Method 8015) analyses. The soil screening results were used for soil waste characterization.

During the 1995 field effort, waste cuttings from the Geoprobe® boreholes were placed into a plastic-lined 5-gallon bucket. Decontamination water was collected and placed into a 30-gallon trash can located within close proximity of the mobile laboratory around the decontamination and staging area. A composite soil cutting sample and a wastewater sample were screened using the on-site field GC for HAZWRAP QC Level B analyses of the same target compounds as those of the environmental samples.

The laboratory analytical results for the decontamination wastewater were compared by Pennsylvania ANG personnel to the city of Pittsburgh's requirements for release to the sanitary sewer system. Investigation-derived waste characterization results are presented in Section 6.3. No constituents were detected in concentrations which exceeded these requirements and the water was subsequently released to a sanitary drain. The analytical results for soils also fell within the criteria for clean fill according to Pennsylvania ANG personnel. Base personnel also stated that waste soil cuttings were added to soil which was already located behind the staircase of Building 102.

4.6 SURVEYING

The United States Geological Survey (USGS) Coordinate System was used for the horizontal and vertical control for the surveying activities. Liadis Engineering and Surveying, Inc. was subcontracted to perform surveying activities in 1994 and 1995. A USGS benchmark located across from the airport at the U.S. Air Force Reserve (Figure 2-2) was used for this control. SOV survey grid corners, confirmational sample locations, and the piezometers were located

by state licensed surveyors. The horizontal control was surveyed in feet to an accuracy of ±0.1 ft; the vertical control was surveyed in feet AMSL to an accuracy of ±0.01 ft. A USGS benchmark located across the airport at the U.S. Air Force Reserve was used for this survey control. All sampling locations, as well as the piezometer locations, are presented in Section 6.0. All surveying data are provided in Appendix G.

5.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

A discussion of the ARARs for the SI is presented in the following sections.

5.1 PENNSYLVANIA STANDARDS

To address release confirmation, release reporting, and corrective action requirements, the Pennsylvania Environmental Quality Board (EQB) finalized 25 Pa. Code Chapter 245.310 Storage Tanks; Corrective Action. The regulations include requirements for confirming or disproving suspected releases. Section 245.310 requires that a site characterization report by completed which describes the activities undertaken during the site characterization. This SI Report meets the requirements of the site characterization report.

The Pennsylvania Land Recycling and Environmental Remediation Standards Act (Act 2) became effective July 18, 1995. Section 106 of Act 2 established environmental remediation cleanup standards in compliance with applicable Federal regulatory requirements. Section 301(a) of Act 2 identifies three types of environmental standards: Background, Statewide Health, and Site-Specific. Each of these standards is designed to be protective of public health and the environment but not more stringent than EPA requirements. These three standards, as they apply to soils, are discussed in the following sections. Only standards applicable to soils and surface sediments are addressed as only soil and surface sediment contamination was addressed in the Site 7 SI.

For sites where petroleum products are the only suspected contaminant, Act 2 has specifically identified a remediation standard independent of the three standards identified above. For soil this standard is a TPH concentration of 500 ppm. This was the criteria used to evaluate TPH concentrations in Site 7 soils. For groundwater this standard is the practical quantitation limit of the analytical method.

5.1.1 Background Standards

Background is defined in Act 2 as, "the concentration of a regulated substance that is present at a site, but is not related to the release of regulated substances at the site." If the primary contaminants in soils and groundwater are below the default Background Standards, the need to perform a background determination study for these media is eliminated. If the default background values are exceeded, a background evaluation may be performed based on the specific features of the site. Compliance with the Background Standard can be demonstrated by developing statistically representative contaminant concentrations through on-site samples or the comparison of site sample results with the default Background Standard. According to Act 2, Section 303(c), in the event that a Statewide Human Heath Standard (SHS) for a regulated substance is less than a Background Standard for a particular site, the site should come into compliance with the Background Standard. This requirement applies to groundwater standards for Site 7 because the Background Standard of 5.00 ppb for BTEX is below the SHS for these constituents.

5.1.2 Statewide Health Standards

Act 2, Section 303(a) required the EQB to develop human health standards for regulated substances for soil and water. SHSs have been developed using health risk calculations to determine an acceptable level of contamination based on a specific exposure pathway. If a regulated substance is a carcinogen, the medium-specific concentration is the concentration which would represent an excess upper bound lifetime cancer target risk of between 1 in 10,000 and 1 in 1,000,000. In cases of systemic toxicants, medium-specific concentrations are levels where people could be exposed by direct ingestion or inhalation on a daily basis without appreciable risk of deleterious effects. SHSs have been developed for soil and groundwater, but can be extended to include surface water and air. The regulations determined by the EQB may not be more stringent than those at the Federal level (Section 303 (c)).

Soil

PaDER has identified soil SHSs for two exposure pathways. The first pathway is based on the incidental ingestion of soils in residential and non-residential settings. The second pathway is based on the soil to groundwater pathway. Both land-use setting standards provide the same level of human health protection based on differing exposure patterns and the use of deed notices for non-residential cleanups.

The non-residential ingestion standards for both organics and inorganics apply to a depth of 15 ft or the depth of vertical contamination, whichever is encountered first. The standards are valid for an exposure frequency of no more than 250 days/year for 25 years. The incidental soil ingestion rate used to determine carcinogenic effects is 50 mg/day, and for non-carcinogenic effects, is 100 mg/day for both organics and inorganics.

For the purposes of this SI, the non-residential ingestion standards will be used and are included in Appendix H. This decision was based on the fact that no residences are present on the facility and it is unlikely that any will be located there in the future. This standard is also applicable since no contaminants were detected in the confirmation samples above these standards and the maximum depth to refusal was 14 ft bgs, above the 15 ft bgs limit.

5.1.3 Site-Specific Standards

The objective of the Site-Specific Standard is to evaluate detailed site information using a rigorous scientific evaluation of a remedy to provide a safe, protective cleanup standard unique to that site. Where the Site-Specific Standard is selected or where another standard was selected but not met, RI, risk assessment (where necessary), cleanup plans, and final reports are required to be developed using criteria outlined in Act 2 (Section 304(a)). Site-Specific Standards are not required to be met when they are numerically lower than the Background Standard or the SHS (Section 304 (h)). Site-Specific Standards have not been developed for IRP Site 7.

5.2 EPA REGION III PRELIMINARY REMEDIATION GOALS

At this time PaDER has developed Background Standards or non-residential SHSs for only certain organic compounds and the inorganic element lead. PaDER continues to use the levels presented in *Cleanup of Contaminated Soils* (Commonwealth of Pennsylvania, December 1993) as their default criteria for all other organic compounds and inorganic elements. These criteria are based on residential exposure settings. The assumptions used for these calculations were an exposure frequency of 100 days/year, 6 years as a child and 24 years as an adult.

For non-residential exposure settings not covered by PaDER Background Standards or SHSs, EPA Region III non-residential Risk-Based Concentrations (RBCs) have been used in this evaluation. Assumptions used for these calculations were an exposure frequency of 250 days/year, 25 years as an adult. These are the same assumptions used to calculate a PaDER non-residential SHS. EPA Region III RBCs are included in Appendix H.

6.0 INVESTIGATION FINDINGS

This section presents the data generated by the SI program conducted at the 171st ARW, Pennsylvania ANG, Coraopolis, Pennsylvania along with a discussion of the findings for each site area. Each section identifies the sample locations, discusses the screening and confirmation analytical results, and compares the contaminant concentrations to ARARs or Preliminary Remediation Goals. Significant findings relating to geologic conditions and identification of data gaps are also presented. This section concludes with a discussion of investigation-derived waste handling.

Screening data obtained from field GC analyses were compared to laboratory data to determine the comparability of the data sets. In general, detects of compounds reported by the field GC are biased high when compared to laboratory results. The screening data should not be interpreted as representing absolute concentrations of organic compounds. Instead, these data should be used as an indicator of the relative concentrations of organic compounds in Site 7 soils. Screening data are included in Appendix C.

The interpretations presented in this section are based on field and laboratory data collected during this investigation. The laboratory data tables included in this section present only those compounds and analytes for which a positive result was detected in at least one sample at that site. For those samples with duplicate analyses, one concentration is reported on the figures and the sample pair is discussed as a single sample. The method used in determining the concentration for sample pairs is presented in Appendix E. The complete listing of laboratory analytical results is contained in Appendix F.

Although only one site was addressed in this SI, the results of the investigation will be presented separately for the two areas which make up Site 7, the POL Storage Area and the Fuel Hydrant Pipeline.

6.1 SITE 7 POL STORAGE AREA

The interpretations presented in this section are based on results of data collected during this SI and previous investigations at the site.

The SI field activities completed in Site 7's POL Storage Area include:

- Installation of three temporary piezometers and water level measurements
- Collection and on-site GC analysis of 33 soil gas samples from 29 locations
- Collection and on-site GC analysis of 8 groundwater samples
- Collection and on-site GC analysis of 5 soil samples
- Collection and submission of 10 subsurface soil samples from 7 soil borings for laboratory analysis of BTEX and TPH

- Collection and submission of 6 subsurface sediment samples for laboratory analyses of BTEX and TPH.

The findings of the SI at the POL Storage Area of Site 7 are presented in the following discussions of geology and hydrology, field screening analytical results, and confirmation analytical results.

6.1.1 Geology and Hydrology

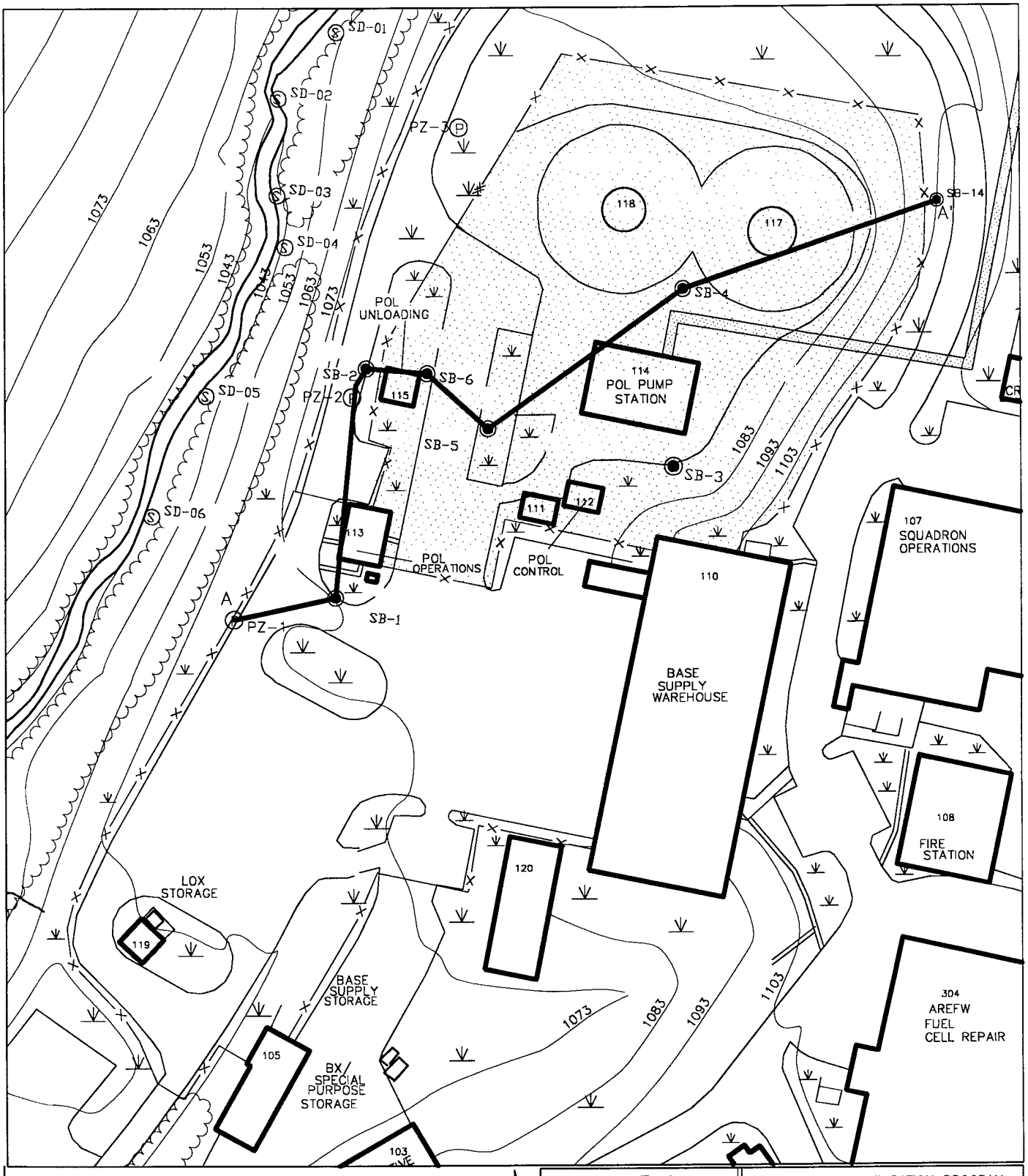
The geology and hydrology of the Base and the specific geology and hydrology at Site 7 POL Storage Area are presented in the following subsections. Specifics about the geology and hydrology at Site 7 Fuel Hydrant Pipeline are presented in Subsection 6.2.1.

6.1.1.1 Site Geology

The regional and local geologic setting of the Base was discussed in Section 3.3 of this report. The following interpretation of the site geology is based on data generated from screening and confirmation Geoprobe® sampling activities in Site 7. Geologic interpretations are based on boring logs, consisting of lithologic data derived from the examination of soil samples, and depths to refusal. Twenty-one boring logs were generated from 19 confirmation soil borings and 2 screening borings. Boring log data extends from the surface to 12.5 ft bgs in Site 7 POL Storage Area. Figures 6-1 and 6-2 present the locations of the confirmation soil borings in Site 7 POL Storage Area and illustrate the location of interpretative geologic and hydrologic cross section A - A'. Soil lithologies are identified according to color and USCS descriptions. Boring logs are presented in Appendix B.

Generally, subsurface soils in Site 7 POL Storage Area primarily consist of clays and silt with lesser amounts of sands and weathered shale fragments. The clays and silt (CL to ML) are predominantly light olive to yellowish-brown to dark brown with some mottling occurring. Thin deposits (approximately less than 1 ft to 2 ft in thickness) of yellowish-brown to brown very fine to medium-grained silty sand and sandy silt (SM to ML) occur locally. Some of the sand and silt deposits are interpreted as discontinuous lenses, and may locally be reworked fill used for previous site area construction. Local subsurface soils are reportedly underlain by shale bedrock of the Pennsylvanian-aged Conemaugh Group, which is primarily a series of interbedded limestones, shales, sandstones and siltstones. Site 7 area subsurface soils developed over weathered sections of shale bedrock, as evidenced by the presence of weathered shale bedrock clasts in soil samples.

Refusal of the Geoprobe® sampling rod was interpreted to represent bedrock. Refusal was encountered from 1 to 18 ft in the POL Storage Area. Refusal depths for sampling locations throughout the Base were used with the available surface elevations, surveyed and extrapolated, to develop bedrock surface elevations as listed in Table 6-1. A bedrock surface elevation map is presented on Figure 6-3. As shown on Figure 6-3, a north to south trending bedrock surface high extends across the central portion of the Base. The bedrock surface appears to mirror surface topography as shown on Figures 2-3 and 2-4. Basewide, the weathered shale bedrock surface appears to dip downward at an average gradient of 0.08 ft/ft to the west, south and east. In the POL Storage Area, the bedrock surface slopes at a similar gradient to the west and southwest.



LEGEND

- SITE BOUNDARY
- 37 BUILDING AND NUMBER
- FENCE
- ROAD
- GRASS
- TREES
- 1103 TOPOGRAPHIC CONTOUR
- CONTOUR INTERVAL 10'
- SB-2 SOIL BORING LOCATIONS
- SD-06 SEDIMENT SAMPLE LOCATIONS
- PZ-2 PIEZOMETER LOCATIONS

0 50 100 FEET

N

FIGURE 6-1

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – POL STORAGE AREA
LINE OF INTERPRETATIVE GEOLOGIC AND HYDROGEOLOGIC CROSS SECTION A–A'
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT

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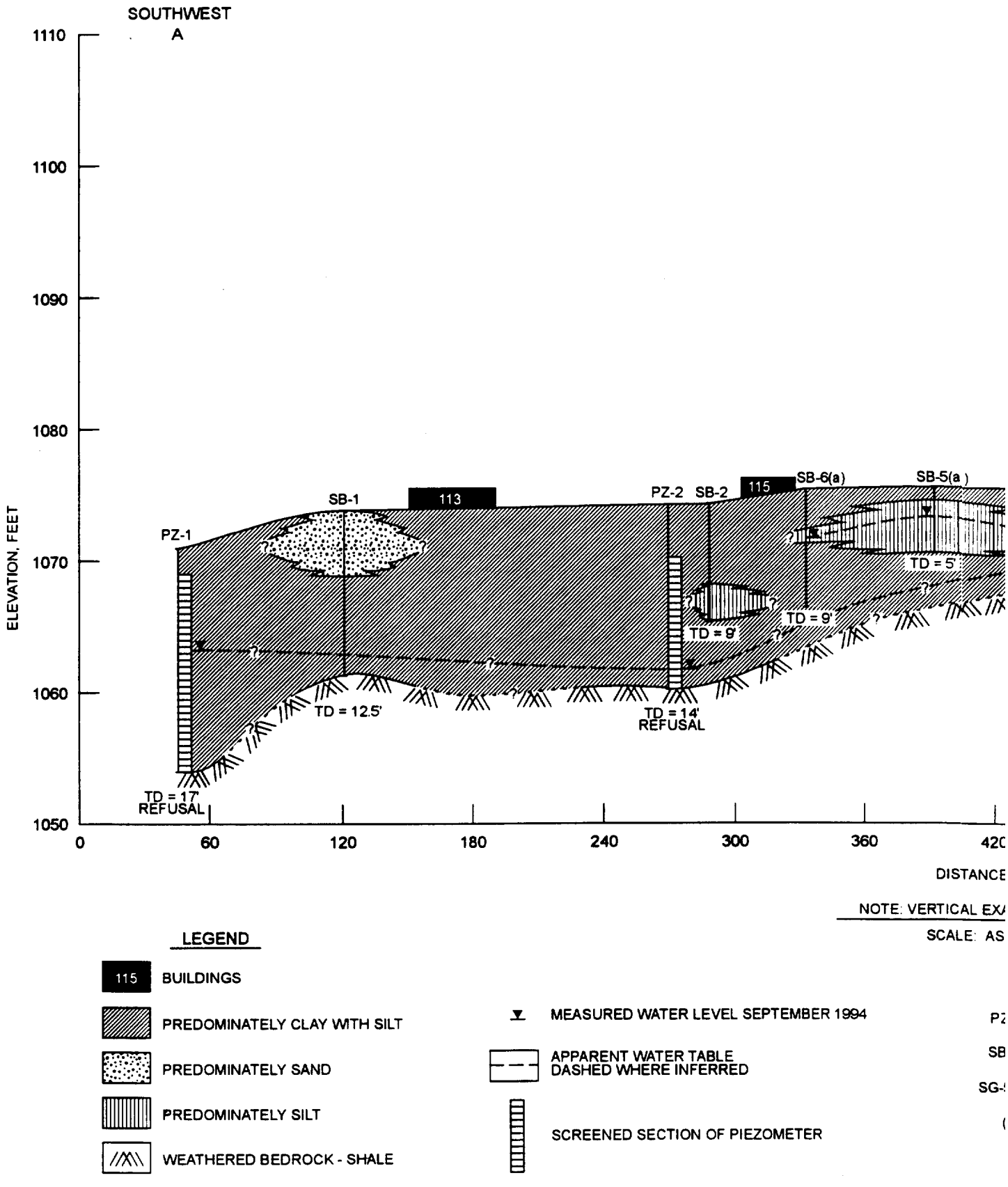
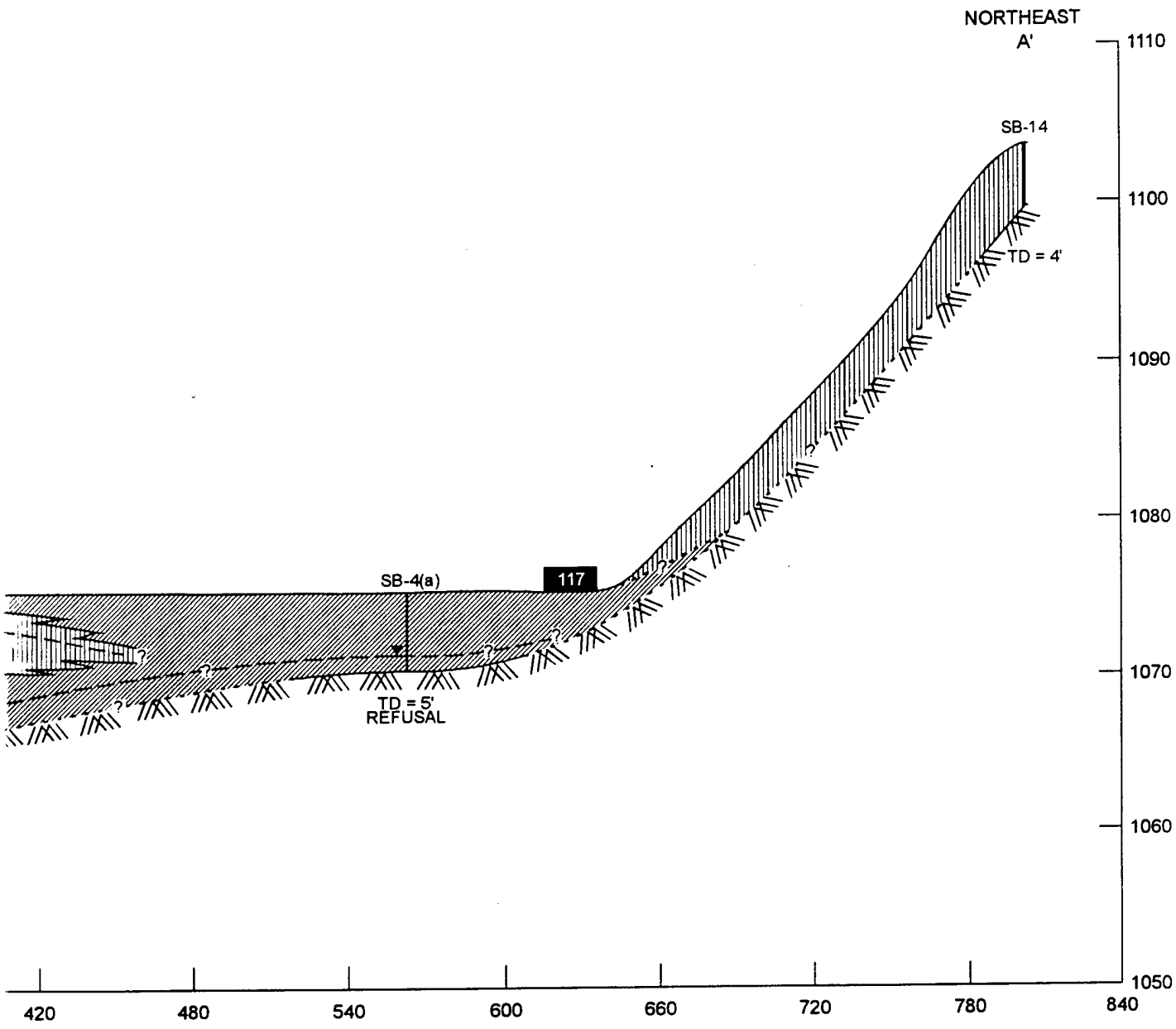
FIG6_20.DWG 10/95


SOUTHWEST
A
1110
1100
1090
1080
1070
1060
1050
ELEVATION, FEET
PZ-1
SB-1
113
PZ-2
SB-2
115
SB-6(a)
SB-5(a)
TD = 12.5'
TD = 17'
REFUSAL
TD = 14'
REFUSAL
TD = 9'
TD = 9'
TD = 5'
0
60
120
180
240
300
360
420
DISTANCE
NOTE: VERTICAL EXA
SCALE: AS
LEGEND
115 BUILDINGS
PREDOMINATELY CLAY WITH SILT
PREDOMINATELY SAND
PREDOMINATELY SILT
WEATHERED BEDROCK - SHALE
MEASURED WATER LEVEL SEPTEMBER 1994
APPARENT WATER TABLE
DASHED WHERE INFERRED
SCREENED SECTION OF PIEZOMETER
PZ
SB
SG-



'ANCE, FEET

\L EXAGGERATION = 6X

E: AS SHOWN

PZ-1 PIEZOMETER LOCATION

SB-6 SOIL BORING LOCATION

SG-57 SCREENING LOCATION

(a) GROUNDWATER SCREENING WATER LEVEL OF SG-57, SG-16, AND SG-25 ARE PROJECTED ONTO SB-6, SB-5 AND SB-4, RESPECTIVELY

Figure 6-2

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171ST AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 - POL STORAGE AREA INTERPRETIVE GEOLOGIC AND HYDROGEOLOGIC CROSS SECTION A-A'

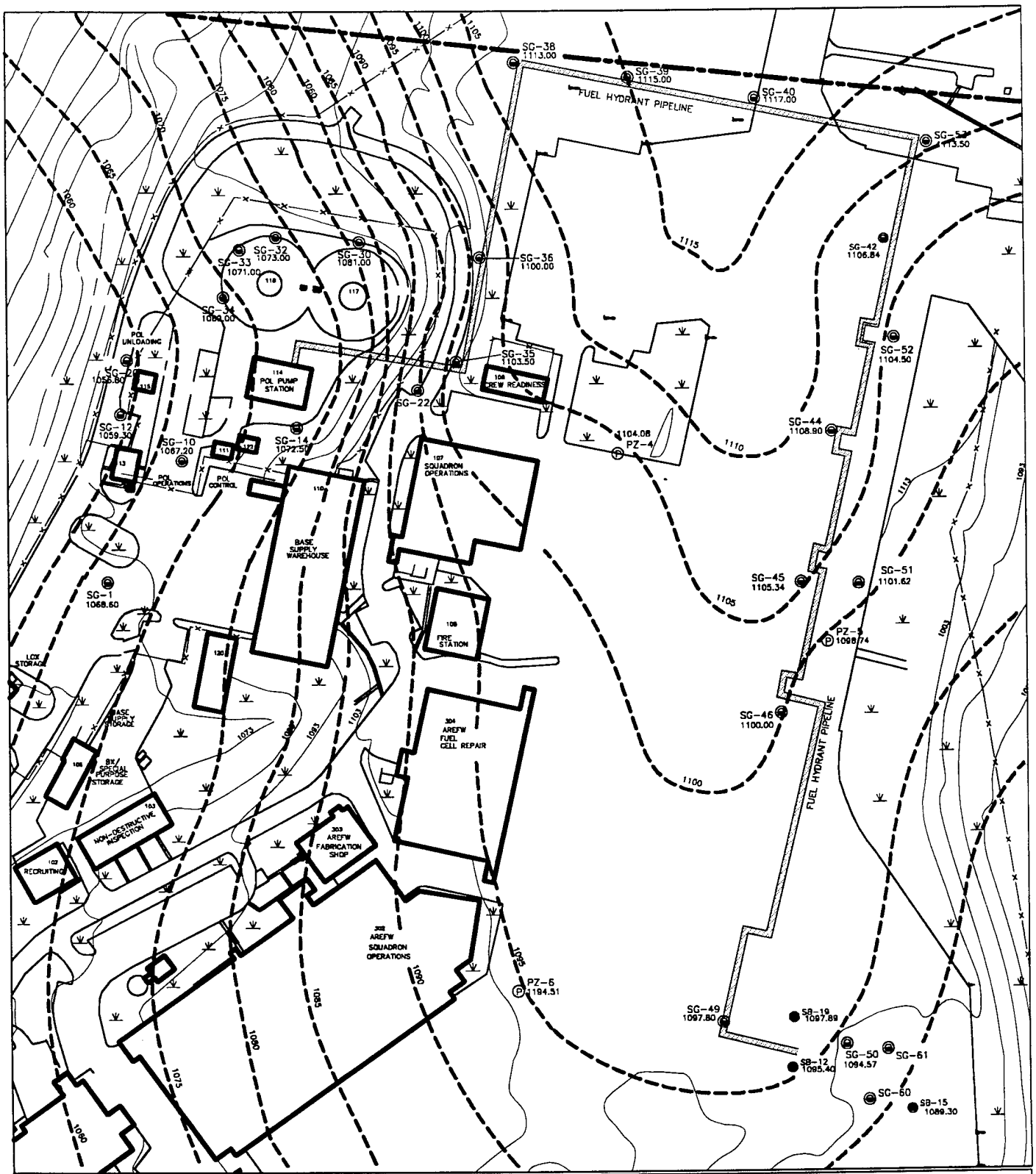
POLB.cdr

(2)

Table 6-1 Interpretative Bedrock Surface Elevations
171st Air Refueling Wing, Pennsylvania Air National Guard
Coraopolis, Pennsylvania

Location	Refusal Depth (ft)	Surface Elevation (ft)	Refusal/Bedrock Elevation (ft)
P-S7-SG-01[1]	6	1072.6	1068.6
P-S7-SG-10[1]	15	1076.2	1067.2
P-S7-SG-12[1]	15.5	1074.8	1059.3
P-S7-SG-14[3]	4.5	1077.0	1072.5
P-S7-SG-15[4]	13	1102.31	1089.31
P-S7-SG-20[1]	18	1074.8	1056.8
P-S7-SG-30[1]	1	1082.0	1081.0
P-S7-SG-32[1]	7	1080.0	1073.0
P-S7-SG-33[1]	5	1076.0	1071.0
P-S7-SG-34[1]	7	1076.0	1069.0
P-S7-SG-35[1]	8.5	1112.0	1103.5
P-S7-SG-36[1]	6	1106.0	1100.0
P-S7-SG-38[1]	7	1120.0	1113.0
P-S7-SG-39[1]	5	1120.0	1115.0
P-S7-SG-40[1]	3	1120.0	1117.0
P-S7-SG-42[2]	8	1116.61	1108.64
P-S7-SG-43[2,3]	13	1116.4	1103.4
P-S7-SG-44[1]	5.5	1114.1	1108.9
P-S7-SG-45[2,3]	5.5	1110.84	1105.34
P-S7-SG-46[1]	10	1110.0	1100.0
P-S7-SG-49[1]	7	1104.8	1097.8
P-S7-SG-50[4]	9	1103.57	1094.57
P-S7-SG-51[2]	9.5	1111.12	1101.62
P-S7-SG-52[1]	11.5	1116.0	1104.5
P-S7-SG-53[1]	6	1119.5	1113.5
P-S7-SB12[3]	8	1103.40	1095.40
P-S7-SB15[4]	13	1102.31	1089.31
P-S7-SB19[2]	6	1103.89	1097 .89
P-S7-PZ-01[2]	17	1070.97	1053.97
P-S7-PZ-02[2]	14	1073.97	1059.97
P-S7-PZ-03[2]	13	1078.16	1065.16
P-S7-PZ-04[2]	9.5	1113.58	1104.08
P-S7-PZ-05[2]	11.5	1110.24	1098.74
P-S7-PZ-06[2]	9.5	1104.01	1094.51

(1) Surface elevations extrapolated from base topographic map
(2 Surface elevations surveyed during 1994 field effort
(3) Surface elevation for SG-43 and SG-45 surveyed represent survey elevations of PS7-SB8 and PS&-SB10, respectively
(4) Surface elevations surveyed during 1995 field effort



LEGEND

- ANG BOUNDARY
- SITE BOUNDARY
- 37 BUILDING AND NUMBER
- FENCE
- ROAD
- GRASS
- TREES
- 1105 INFERRED BEDROCK ELEVATION CONTOUR CONTOUR INTERVAL 5'
- 1103 TOPOGRAPHIC CONTOUR CONTOUR INTERVAL 10'
- SG-2 SOIL SCREENING LOCATIONS
- SB-21 SOIL BORING LOCATIONS
- P 5 PIEZOMETER LOCATIONS

0 90 180 FEET

N

FIGURE 6-3

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – FUEL HYDRANT PIPELINE INTERPRETATIVE BEDROCK ELEVATION CONTOURS

PENNSYLVANIA AIR NATIONAL GUARD PITTSBURGH INTERNATIONAL AIRPORT

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PFIG6-18.DWG 10/95

Interpretative geologic and hydrologic cross-section A-A' presented on Figure 6-2 was selected to represent the vertical and horizontal extent of geologic lithologies across the POL Storage Area. Geologic interpretation is focused on the differentiation of clay, silt, sand and gravel dominant lithologies. Most depths and thicknesses of lithological units are approximated, based on available data. Screening and confirmation sampling locations and groundwater elevation data from September 1994 field effort are also presented on the profile. All sample location surface elevations were derived from the site survey.

Geologic cross-section A-A' (Figure 6-2) presents a southwest to northeast profile of the POL Storage Area. Quaternary-aged alluvium subsurface sediments were encountered in the borings presented on the cross-section. Piezometer total depths (TDs) range from 14 ft in PS7-PZ2 to 17 ft bgs in PS7-PZ1. No lithological descriptions are available on soils at piezometer locations therefore lithologies are inferred from nearby soil borings. Boring TDs ranged from 4 ft in PS7-SB4 and PS7-SB5 to 12.5 ft bgs in PS7-SB1. Predominantly clay with silt (CL to ML) is the dominant lithology, present from the surface to TD in most borings presented. A surface lens (approximately 4 ft in thickness) of predominantly sand with minor silt and clay (SM to ML) was encountered at PS7-SB1. Subsurface lenses (approximately 2 ft to 4 ft in thickness) of predominantly silt with varying amounts of fine sand (ML to SM) were encountered at depths ranging from approximately 1 to 4 ft bgs in two borings, as illustrated on Figure 6-2. The thickness and areal extent of this lithology is not defined, but is inferred at depth across the POL Storage Area. Water level data indicate a westward-southwestward sloping water table occurring from 4 ft bgs in groundwater screening location PS7-SG25, projected onto cross-section at PS7-SB4, to 12.4 ft bgs in piezometer PS7-PZ2.

6.1.1.2 Site Hydrology

The regional and local hydrologic settings for the Base are discussed in Section 3.5 of this report. The investigation derived hydrologic data for the POL Storage Area are presented in the following discussion of site hydrology.

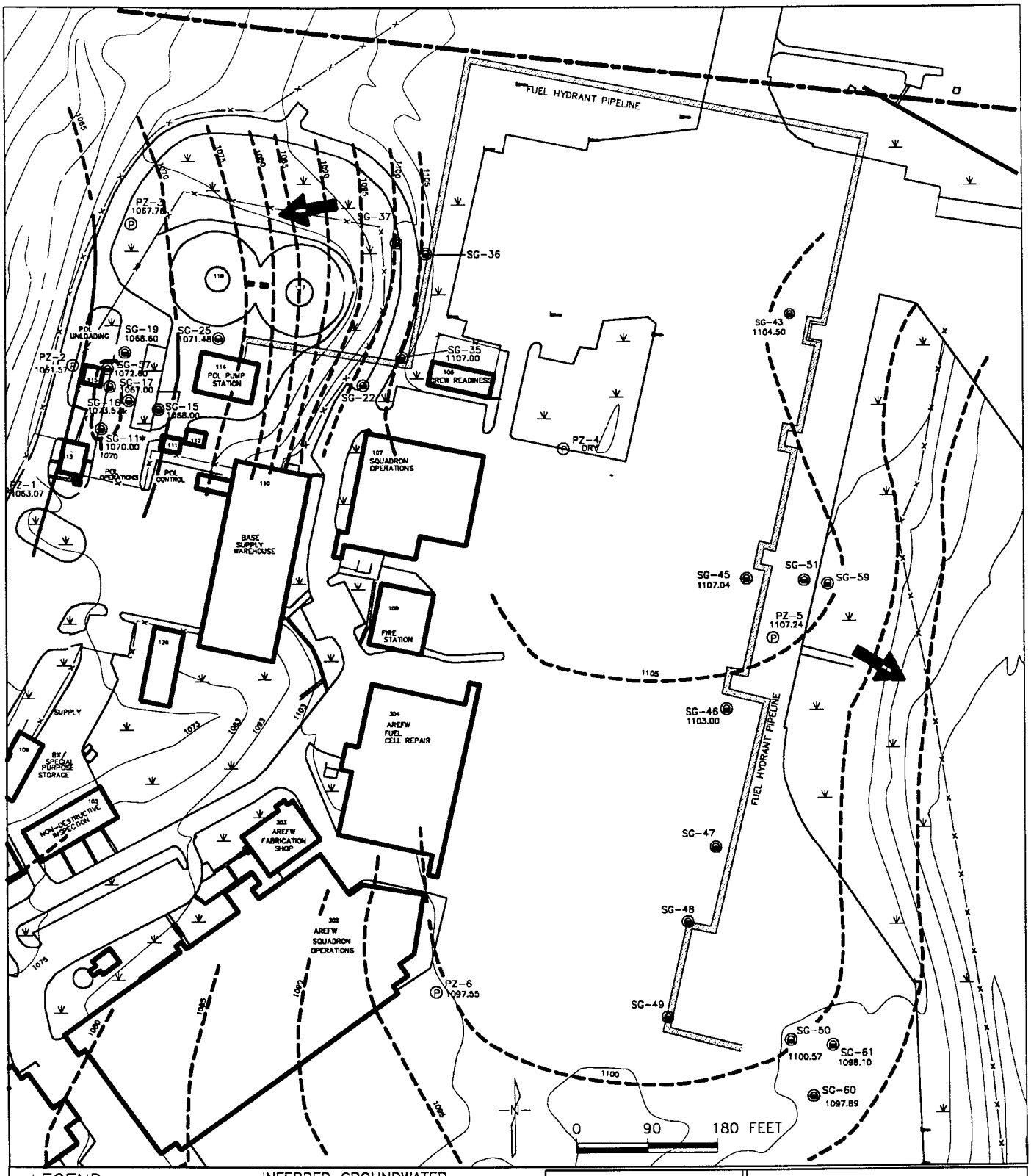
Groundwater elevations were determined using measured water levels in piezometers and estimated groundwater depths at groundwater screening locations. Using surveyed elevations and extrapolated elevations, groundwater elevations were determined and are listed in Table 6-2. A groundwater elevation contour map is presented on Figure 6-4. Groundwater elevations were determined using measured water levels in piezometers and groundwater depths at groundwater screening locations.

The investigation-derived data indicate the presence of a thin zone of saturated soils overlying the bedrock, which are interpreted as generally occurring under water table conditions. The occurrence of locally confined to semi-confined aquifer conditions and local communication with underlying bedrock is possible but is not defined due to the lack of data. Data also indicate the existence of locally occurring saturated soils of higher permeability (dominantly silts and sands) as noted in cross-section A-A' (Figure 6-2). The apparent saturated zone above the depth of refusal ranges in thickness from less than 1 ft (at PZ-2) to 7.5 ft (at PZ-1). The apparent groundwater flows from the northeast to the southwest direction, generally in the same direction as the slope of the underlying bedrock surface and overlying topography. Groundwater appears to flow with an approximated hydraulic gradient of 0.088 ft/ft, based on Figure 6-4. As shown on Figure 6-4, the closed groundwater elevation contour of 1070 ft

Table 6-2 Interpreted Groundwater Surface Elevations
171st Air Refueling Wing, Pennsylvania Air National Guard
Coraopolis, Pennsylvania

Location	Measured Depth to Water (ft/bgs)	Surface Elevation (ft)	Water Level Elevation (ft)
P-S7-SG-11[1,a]	5	1075.0	1070.0
P-S7-SG-15[1,b]	8	1076.2	1068.0
P-S7-SG-16[2,a]	2	1075.57	1073.57
P-S7-SG-17	9	1076	1067
P-S7-SG-19[1,a]	8	1076.6	1068.6
P-S7-SG-25[2]	4	1075.48	1071.48
P-S7-SG-35[1,a]	5	1112.0	1107.0
P-S7-SG-43[2,b]	11	1115.3	1104.3
P-S7-SG-45[2,a]	3.8	1110.84	1107.61
P-S7-SG-46[1,b]	7	1110.0	1103.0
P-S7-SG-50[3,a]	3	1103.57	1100.57
P-S7-SG-57[1,a]	4	1076.6	1072.6
P-S7-SG-60[3,b]	5	1102.89	1097.89
P-S7-SG-61[3,a]	5	1103.1	1098.1
P-S7-PZ1[4]	7.9	1070.97	1063.07
P-S7-PZ2[4]	12.4	1073.97	1061.57
P-S7-PZ3[4]	10.4	1078.16	1067.76
P-S7-PZ4[4]	Dry	1113.58	NA
P-S7-PZ5[4]	3	1110.24	1107.24
P-S7-PZ6[4]	6.46	1104.01	1097.55

(1) Surface elevations extrapolated from base topographic map
(2) Surface elevation for SG-16, SG-25, SG-43, and SG-45 represent surveyed elevation of PS7-SB5, PS7-SB4, PS7-SB8, and PS7-SB10, respectively, from the 1994 field effort.
(3) Surface elevations surveyed during 1995 field effort
(4) Surface elevations surveyed during 1994 field effort
(a) Indicates soil gas sample collected below groundwater sampling depth
(b) Indicates groundwater collected below soil gas sample
NA Not Applicable



LEGEND

- ANG BOUNDARY
- SITE AREA
- 37 BUILDING AND NUMBER
- FENCE
- ROAD
- GRASS
- 1100 INFERRED GROUNDWATER ELEVATION CONTOUR CONTOUR INTERVAL 5'
- 1103 TOPOGRAPHIC CONTOUR CONTOUR INTERVAL 10'
- DIRECTION OF GROUNDWATER FLOW
- SG-2 SOIL GAS, SOIL, AND/OR GROUNDWATER SCREENING LOCATIONS
- SB-21 SOIL BORING LOCATIONS
- PZ-5 PIEZOMETER LOCATIONS

* ELEVATIONS CONTOURED PROBABLY REPRESENTED PURCHED CONDITIONS

FIGURE 6-4

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – FUEL HYDRANT PIPELINE GROUNDWATER ELEVATIONS SEPT 1994 PENNSYLVANIA AIR NATIONAL GUARD PITTSBURGH INTERNATIONAL AIRPORT

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PFIG6-19.DWG 10/95

AMSL, located in the southwest portion of the POL Storage Area, indicates the presence of a perched groundwater area. Using the available geologic and hydrologic data, the perched water zone is interpreted to be up to 2.5 ft in thickness. The thickness and areal extent of groundwater is not defined, but is inferred on Figure 6-2. Vertical communication of groundwater to the weathered bedrock surface is likely to occur but is not defined due to the lack of data.

Based on the sporadic occurrences of groundwater within the thin overburden soils, it is unlikely that a well installed into these soils could sustain year-round withdrawals in amounts equal to, or greater than, 200 gallons per day. The results of this qualitative evaluation suggest that the overburden soils do not appear to fit the definition of an aquifer as defined by Act 2 criteria.

6.1.2 Field Screening Analytical Results

Field screening activities completed at the POL Storage Area included a soil gas survey and field GC screening of soil and groundwater samples during the 1994 field program. No field screening activities occurred in the POL Storage Area during the 1995 field effort. All soil gas, groundwater, and soil samples were collected and screened using the methods described in Section 4.0. The analytical results are summarized below.

6.1.2.1 Field Screening Soil Gas Results

One of the 33 soil gas samples screened on-site, SG-18, showed detections of trans-1,2-dichloroethene (t-1,2-DCE) at 0.32 ppm (Figure 6-5). The presence of 1,2-dichloroethane (1,2-DCA) was detected in three samples, SG-12, SG-16, and SG-18 in concentrations ranging from 0.61 to 2.0 ppm. The detections of t-1,2-DCE, and 1,2-DCA were present in soil gas samples collected at the southwestern end of the POL Storage Area, close to Building 114 and between Buildings 113 and 115. Neither tetrachloroethene or trichloroethene was detected in any of the soil gas samples. Benzene, toluene, and ethylbenzene were only detected in one sample, SG-54, located 20 ft south of the southwest corner of Building 113 (see Figure 6-5), at concentrations of 3.2 ppm, 3.9 ppm, and 4.0 ppm, respectively. Total xylenes were detected in two samples, SG-7 and SG-56, at 1.4 ppm and 2.3 ppm, respectively.

As shown on Figure 6-5, total volatiles (as JP-4) were detected in seven soil gas samples in concentrations ranging from 22 to 270 ppm. The highest concentrations of total volatiles detected in soil gas samples are located at SG-58 (270 ppb) and SG-54 (210) ppb, at the northeastern and southwestern portion of the POL Storage Area, respectively.

6.1.2.2 Field Screening Groundwater Results

Groundwater screening results for the POL Storage Area are shown on Figure 6-6. Of the seven groundwater samples collected, benzene was detected in four samples, SG-16, SG-19, SG-25, and SG-57 at concentrations ranging from 6.6 to 3700 ppb. The highest concentration was detected at SG-57, located east of Building 115. Ethylbenzene was detected in only one sample, SG-57, at a concentration of 7500 ppb. Toluene was detected in five of the seven groundwater samples at concentrations ranging in concentrations from 2.9

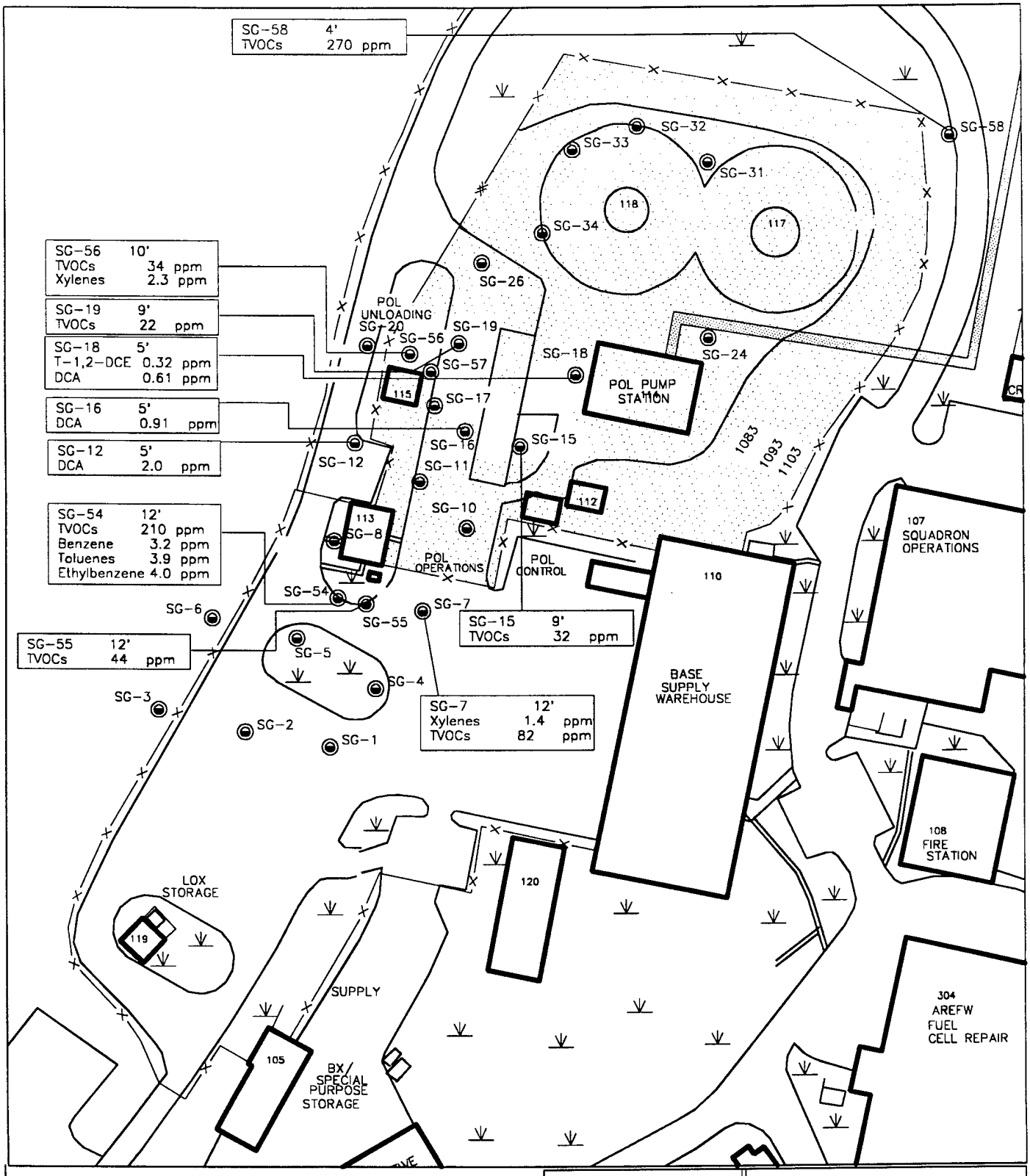

FIGURE 6-5

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – POL STORAGE AREA
SOV SURVEY RESULTS
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT

1/96

PFIG6 05.DWG 10/95

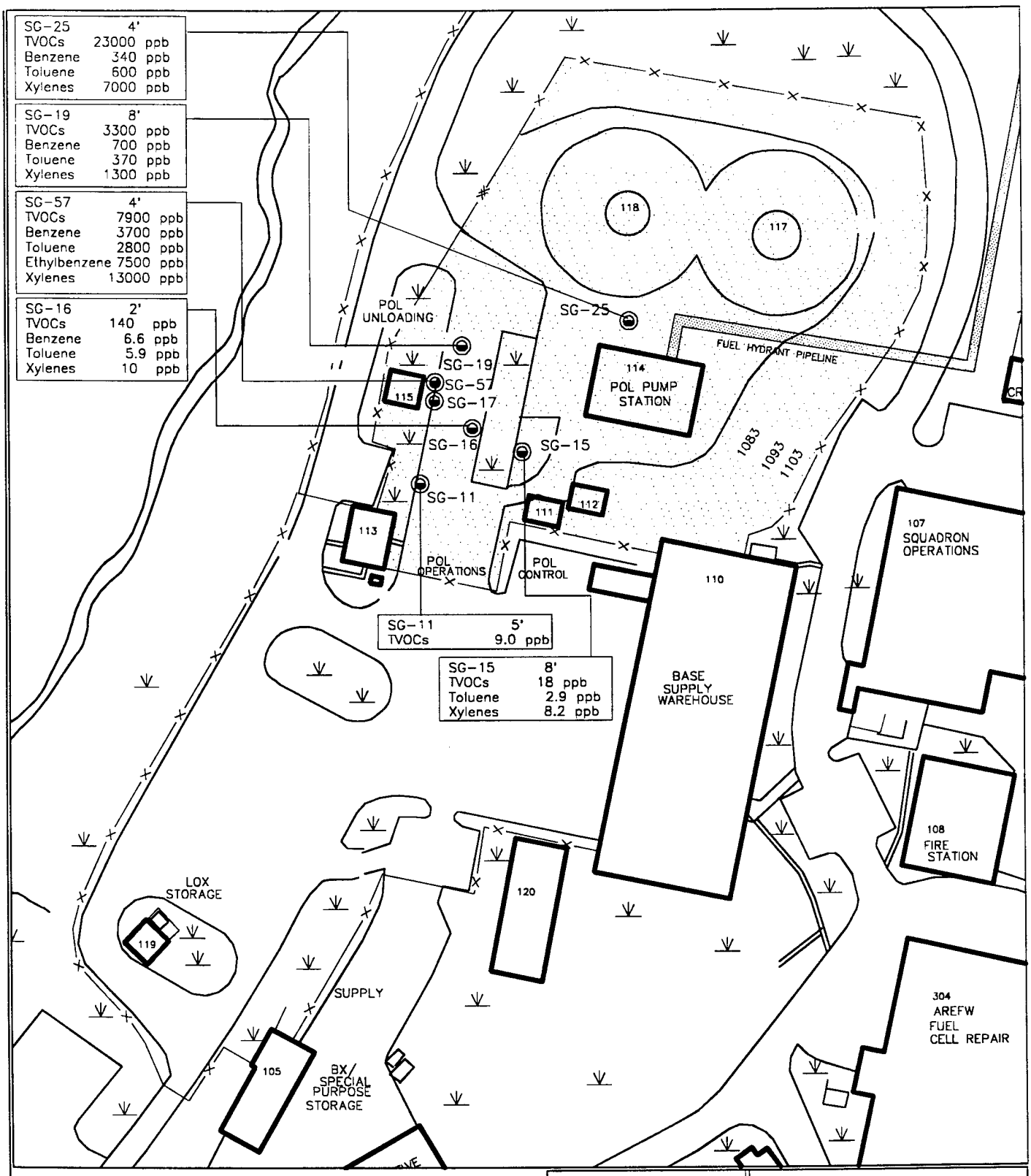

FIGURE 6-6

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – POL STORAGE AREA
GROUNDWATER SCREENING RESULTS
PENNSYLVANIA AIR NATIONAL GUARD
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to 2800 ppb, with the highest concentration detected at SG-57. Total xylenes were detected in the same five samples, ranging in concentrations of 8.2 to 13,000 ppb with the highest concentration at SG-57.

6.1.2.3 Field Screening Soil Results

No chlorinated target compounds were detected in the soil screening samples. Two of the five soil screening samples had benzene detected at concentrations of 4.5 ppb and 370 ppb at locations SG-14 and SG-29, respectively (Figure 6-7). Sampling point SG-14 is located approximately 10 ft southeast of Building 114 and SG-29 is located approximately 40 ft east of tank 117. Toluene, total xylenes, and total volatiles (as JP-4) were detected in three samples, SG-14 and SG-29 as noted above and SG-30, located 40 ft north of tank 117. Concentrations of 11 ppb, 330 ppb, and 120 ppb, respectively, were detected for toluene. Total xylene concentrations of 34 ppb (SG-14), 640 ppb (SG-29), and 270 ppb (SG-30) were detected. Concentrations of 150 ppb (SG-14), 5400 ppb (SG-29), and 2400 ppb (SG-30) were detected for total volatiles (as JP-4). Soil sample location SG-29 contained the highest detected concentrations of toluene, total xylenes, and total volatiles.

6.1.3 Soil Confirmation Results

Ten soil samples from seven locations (7-B01 through 7-B06 and 7-B14) were chosen for laboratory analyses based on the GC screening results. The samples were submitted for HAZWRAP Level C analysis for BTEX and TPH diesel-extractable. Table 6-3 summarizes the analytical results. Sample locations, along with concentrations of all detected organic compounds above their respective ARARs, are shown on Figure 6-8.

6.1.3.1 Laboratory BTEX Results

There were no BTEX concentrations detected in any of the soil samples collected from the POL Storage Area.

6.1.3.2 Laboratory TPH Results

TPH was detected in three soil samples at concentrations which ranged from 26 to 160 ppm. The highest concentration of TPH was detected at 7-B03, from 0 to 1 ft bgs, located 20 ft south of the southeast corner of Building 114, as shown on Figure 6-8. These concentrations are below the respective ARAR.

6.1.4 Sediment

Surface sediment sample locations collected along McClarens Run are shown on Figure 4-2. The bottom of McClarens Run is bedrock. Although McClarens Run is shallow in depth, the current is swift enough to wash the creek bed of sediment. However, sediment build-up did occur in some areas and sediment samples were collected from these areas. At the locations without sediment build-up in the creek, the samples were collected from the creek bank, as close to the creek bed as possible. Neither BTEX nor TPH was detected in any of the six sediment samples analyzed. In addition to the collection method, Table 4-4 in Section 4.0 presents information on sample locations.

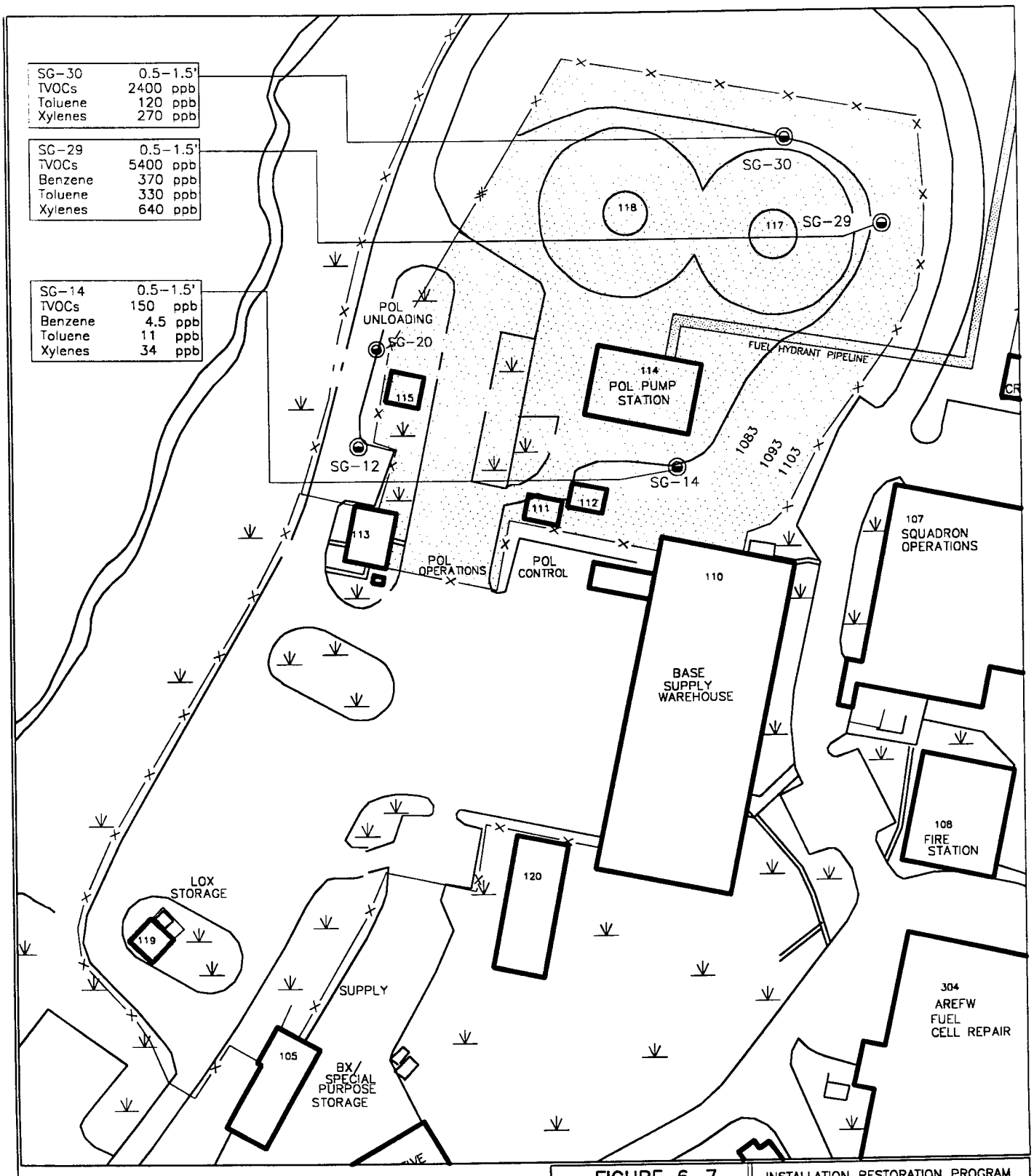

FIGURE 6-7

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – POL STORAGE AREA
SOIL SCREENING RESULTS
PENNSYLVANIA AIR NATIONAL GUARD
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PFIG6_10.DWG 10/95

Table 6-3 Site 7: POL Storage Area Data Summary Table
171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

LOCATOR:	7-B01		7-B01		7-B02		7-B02		7-B03		7-B04	
SAMPLE ID:	P-S7-B01-0406		P-S7-B01-0911		P-S7-B02-0305		P-S7-B02-0709		P-S7-B03-0001		P-S7-B04-0305	
COLLECTION DATE:	11/15/94		11/15/94		11/16/94		11/16/94		11/17/94		11/16/94	
ASSOCIATED QC:	P-S7-TB1-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB1-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1117,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116	
CRITERIA[1] UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
TPH by SW-846 Method 8015 Modified California LUFT												
TPH-diesel 500 mg/kg	26 mg/kg		45 mg/kg		12 mg/kg	B	12 mg/kg	B	160 mg/kg		23 mg/kg	B

mg/kg milligrams/kilogram

[1] Criteria is Pennsylvania Department of Environmental Protection Act 2 standard.

Data Validation Qualifiers
(I) Result is between the detection limit and the quantitation limit
B Possible blank contamination

Table 6-3 (Continued) Site 7: POL Storage Area Data Summary Table
171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

LOCATOR:	7-B05		7-B06		7-B06		7-B14	
SAMPLE ID:	P-S7-B05-0305		P-S7-B06-0305		P-S7-B06-0709		P-S7-B14-0204	
COLLECTION DATE:	11/16/94		11/16/94		11/16/94		11/16/94	
ASSOCIATED QC:	P-S7-TB2-1116,P-S7-EB1-1115 S7-FB1-1115,S7-FB2-1115		P-S7-TB2-1116,P-S7-EB1-1115 S7-FB1-1115,S7-FB2-1115		P-S7-TB2-1116,P-S7-EB1-1115 S7-FB1-1115,S7-FB2-1115		P-S7-TB2-1116,P-S7-EB1-1115 S7-FB1-1115,S7-FB2-1115	
CRITERIA[1] UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
TPH by SW-846 Method 8015 Modified California LUFT								
TPH-diesel 500 mg/kg	12 mg/kg	B	11 mg/kg	()B	11 mg/kg	()B	7.40 mg/kg	()B

mg/kg milligrams/kilogram

[1] Criteria is Pennsylvania Department of Environmental Protection Act 2 standard.

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Possible blank contamination

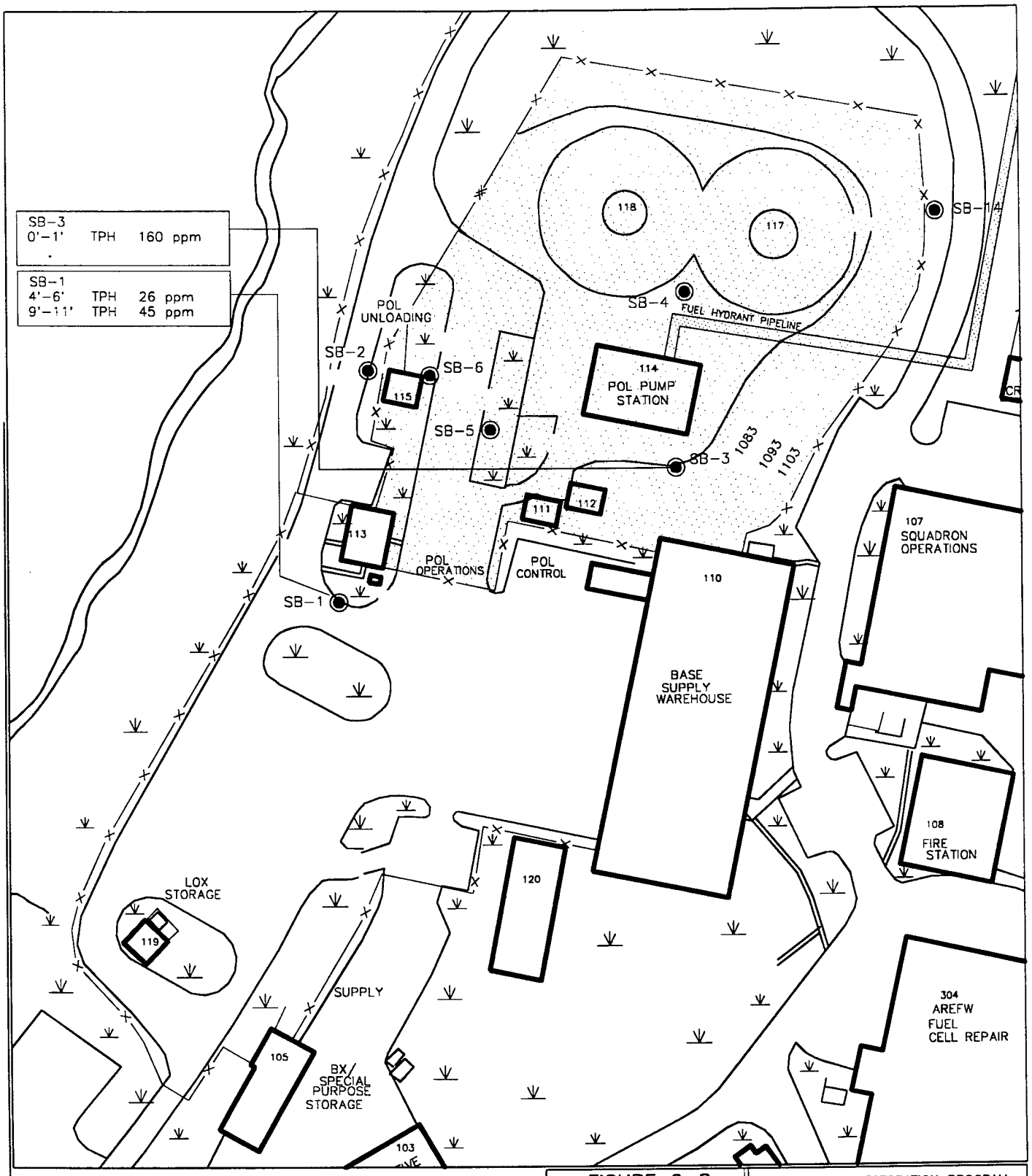

FIGURE 6-8

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – POL STORAGE AREA
SOIL CONFIRMATION RESULTS
PENNSYLVANIA AIR NATIONAL GUARD
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PFIG6_13.DWG 10/95

6.2 SITE 7 FUEL HYDRANT PIPELINE

The SI field activities completed in Site 7 - Fuel Hydrant Pipeline:

- Installation of three piezometers and water level measurements.
- Collection and on-site GC analysis of 41 soil gas samples from 28 locations.
- Collection and on-site GC analysis 8 of groundwater samples.
- Collection and on-site GC analysis of 6 soil samples.
- Collection and submission of 17 soil samples from 12 soil borings for laboratory analyses of BTEX and TPH.

The findings of the SI at the Fuel Hydrant Pipeline of Site 7 are presented in the following discussions of geology and hydrology, field screening analytical results, and confirmation analytical results.

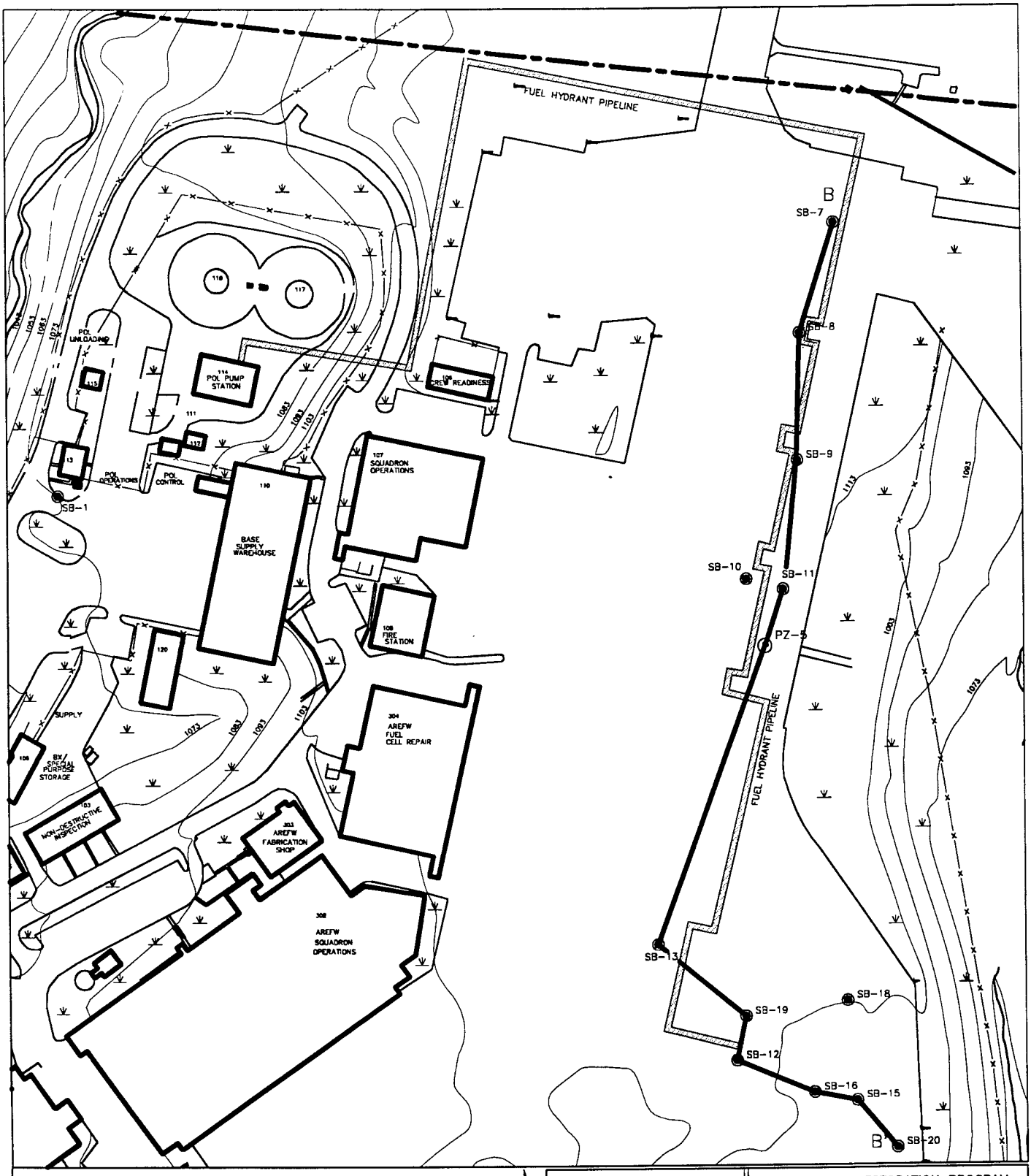
6.2.1 Geology and Hydrology

The geology and hydrology of the Base and the specific geology and hydrology at Site 7 POL Storage Area are presented in Sections 6.1.1. Specifics about the geology and hydrology at Site 7 Fuel Hydrant Pipeline are presented in the following sections.

6.2.1.1 Site Geology

The regional and local geologic setting of the Base was discussed in Section 3.3 of this report. The following interpretation of the site geology is based on data generated from screening and confirmation Geoprobe® sampling activities in Site 7. Geologic interpretations are based on boring logs, consisting of lithologic data derived from the examination of soil samples, and depths to refusal. Twenty-one boring logs were generated from 19 confirmation soil borings and 2 screening borings. Boring log data extends from the surface to 13 ft bgs in Site 7 Fuel Hydrant Pipeline. Figures 6-9 and 6-10 present the locations of the confirmation soil borings in Site 7 Fuel Hydrant Pipeline and the location of interpretative geologic and hydrologic cross section B - B´. Soil lithologies are identified according to color and USCS descriptions. Boring logs are presented in Appendix C.

Generally, subsurface soils in Site 7 Fuel Hydrant Pipeline primarily consist of clays and silt with lesser amounts of sands and weathered shale fragments. The clays and silt (CL to ML) are predominantly light to yellowish-brown to medium brown with some mottling occurring. Thin deposits (approximately 1 ft in thickness) of gravel within a yellowish brown clay and very fine to medium-grained sand matrix (GC to GP) occur locally. Some of the sand and silt deposits are interpreted as discontinuous lenses, and may locally be reworked fill used for previous site area construction. Local subsurface soils are reportedly underlain by shale bedrock of the Pennsylvanian-aged Conemaugh Group, which is primarily a series of interbedded limestones, shales, sandstones and siltstones. Site 7 area subsurface soils developed over weathered sections of shale bedrock, as evidenced by the presence of weathered shale bedrock clasts in soil samples.



LEGEND

- ANG BOUNDARY
- SITE BOUNDARY
- 37 BUILDING AND NUMBER
- FENCE
- ROAD
- GRASS

0 90 180 FEET

N

SB-16 SOIL BORING CONFIRMATION SAMPLE LOCATIONS

1103 TOPOGRAPHIC CONTOUR CONTOUR INTERVAL 10'

FIGURE 6-9

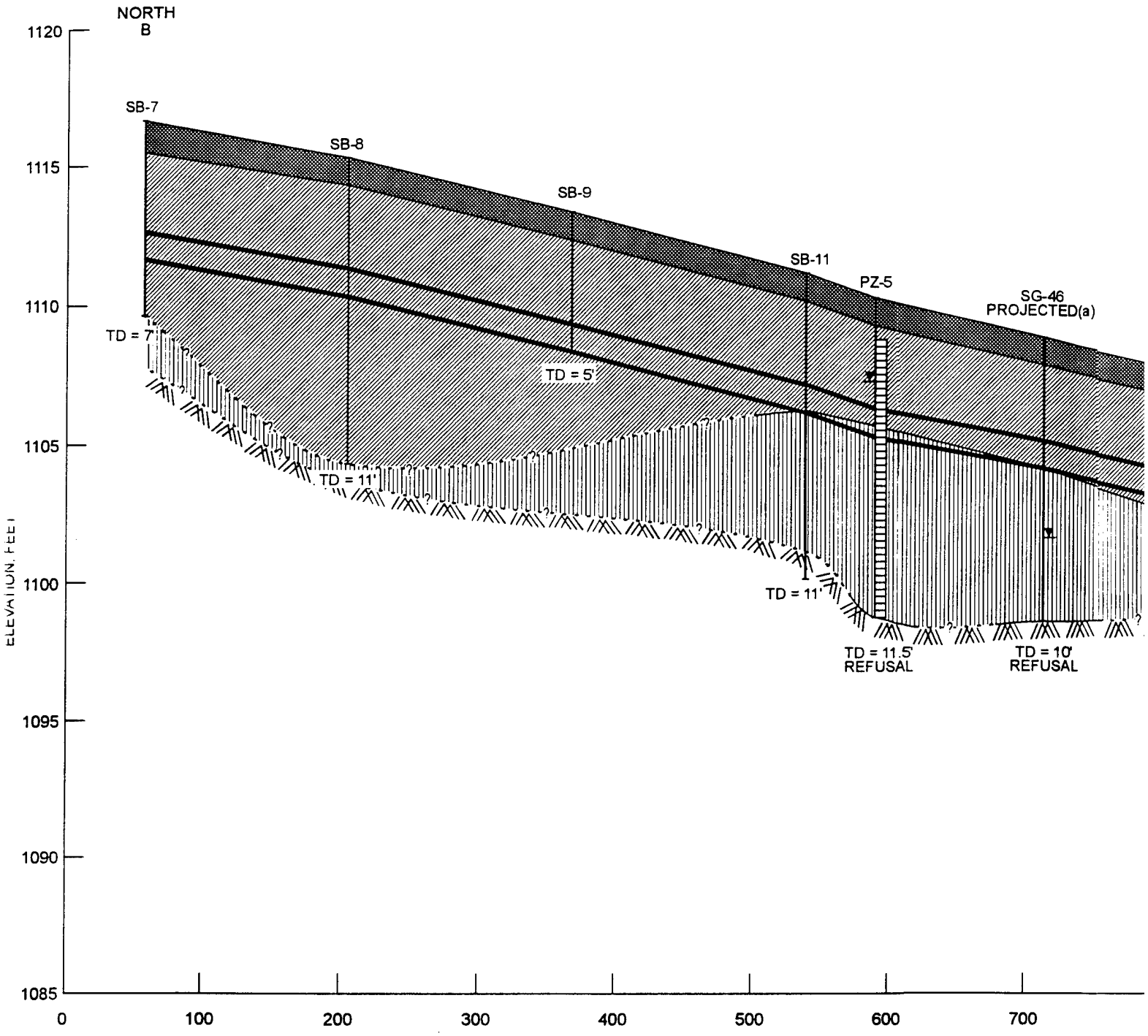
EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – FUEL HYDRANT PIPELINE LINE OF INTERPRETATIVE GEOLOGIC AND HYDROGEOLOGIC CROSS SECTION B–B' PENNSYLVANIA AIR NATIONAL GUARD PITTSBURGH INTERNATIONAL AIRPORT

1/96

PFIG6_21.DWG 10/95



NOTE: VERTICAL EXAGGERA

SCALE: AS SHOWN

LEGEND

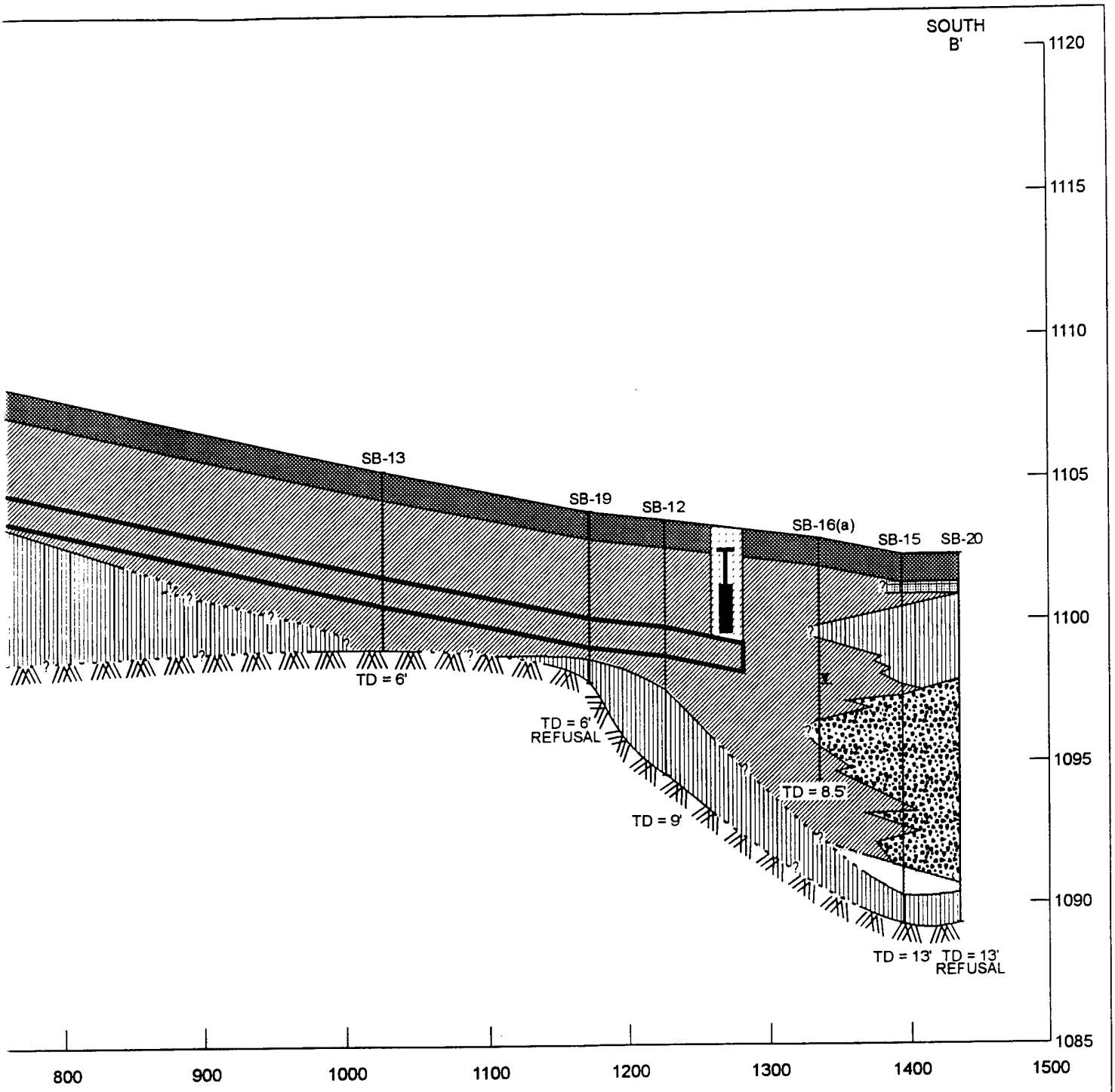
- CONCRETE
- ASPHALT
- PREDOMINATELY CLAY WITH SILT
- PREDOMINATELY GRAVEL WITH SILT, SAND, & CLAY
- PREDOMINATELY ROCK FRAGMENTS
- PREDOMINATELY SILT
- WEATHERED BEDROCK - SHALE
- APPROXIMATE LOCATION AND DEPTH OF PIPELINE PROJECTED ONTO CROSS SECTION

SB-7 SOIL BORING LOCATION

SG-46 SCREENING LOCATION

SCREENED SECTION OF

MEASURED WATER LEV
SEPTEMBER 1994



FEET

GERATION = 20X

SHOWN

ATION

TION

ON OF PIEZOMETER

R LEVEL

(a) MEASURED WATER LEVEL FOR SG-60 PROJECTED ONTO SB-16 AND SG-46 PROJECTED ONTO CROSS SECTION

REPRESENTATIVE OF FUEL DISPENSING VALVE

APPROXIMATE LOCATION OF HYDRANT PIT #5

Figure 6-10

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171ST AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 - FUEL HYDRANT PIPELINE INTERPRETATIVE GEOLOGIC AND HYDROGEOLOGIC CROSS SECTION B-B'

FuelC.cdr

Refusal of the Geoprobe® sampling rod was interpreted to represent bedrock. Refusal was encountered from 5 to 13 ft bgs at Site 7 Fuel Hydrant Pipeline. Refusal depths for sampling locations throughout the Base were used with the available surface elevations, surveyed and extrapolated, to develop bedrock surface elevations as listed on Table 6-1. A bedrock surface elevation map is presented on Figure 6-3. As shown on Figure 6-3, a north to south trending bedrock surface high extends across the central portion of the base. The bedrock surface appears to mirror surface topography as shown on Figures 2-3 and 2-4. Basewide, the weathered shale bedrock surface appears to dip downward at an average gradient of 0.08 ft/ft to the west, south and east. In Site 7 Fuel Hydrant Pipeline, the bedrock surface slopes at a gradient of 0.033 ft/ft to the east and southeast.

Interpretative geologic and hydrologic cross-section B-B' presented in Figure 6-10 was selected to represent vertical and horizontal extent of geologic lithologies across Site 7 Fuel Hydrant Pipeline. Geologic interpretation is focussed on the differentiation of clay, silt, sand and gravel dominant lithologies. Most depths and thicknesses of lithological units are approximated, based on available data. Screening and confirmation sampling locations and groundwater elevation data from September 1994 field effort are also presented on the profile. All sample location surface elevations were derived from the site survey.

Geologic cross-section B-B' (Figure 6-10) presents a north to southeast profile of Site 7 Fuel Hydrant Pipeline. Quaternary-age subsurface sediments were encountered in the borings presented on Figure 6-10. Piezometer TDs range from 9.5 ft in PS7-PZ4 and PS7-PZ6 to 11.5 ft bgs in PS7-PZ5. No lithological descriptions are available on soils at piezometer locations; therefore, lithologies are inferred from nearby soil borings. Boring TDs ranged from 6 ft in PS7-SB13 to 13 ft bgs in PS7-SB15. Predominantly clay with silt (CL to ML) is the dominant lithology, present from 1 ft bgs to TD in most borings presented. A subsurface lens (approximately 4 ft in thickness) of predominantly sand with minor silt and clay (SM to ML) was encountered at PS7-SB1 just below the concrete surface. A subsurface lens (approximately 1 ft to 4 ft in thickness) of predominantly gravel with varying amounts of clay and fine sand (GC to GP) was encountered at depths ranging from approximately 4 to 10 ft bgs in boring PS7-SB15, as illustrated on Figure 6-10. The thickness and areal extent of this lithology is not defined, but is inferred at depth across Site 7 Fuel Hydrant Pipeline. Water level data indicate a eastward-southeastward sloping water table occurring from 4 ft bgs in piezometer PS7-PZ5 to 7 ft bgs in groundwater screening location PS7-SG46, projected onto cross-section B-B´.

6.2.1.2 Site Hydrology

The regional and local hydrologic settings for the Base are discussed in Section 3.5 of this report. The investigation derived hydrologic data for Site 7 Fuel Hydrant Pipeline are presented in the following discussion of site hydrology.

Groundwater elevations were determined using measured water levels in piezometers and estimated groundwater depths at groundwater screening locations. Using surveyed elevations and extrapolated elevations, groundwater elevations were determined and are listed in Table 6-2. A groundwater elevation contour map is presented on Figure 6-4. Groundwater elevations were determined using measured water levels in piezometers and groundwater depths at groundwater screening locations.

The investigation derived data indicate the presence of a thin zone of saturated soils overlying the bedrock, which are interpreted as generally occurring under water table conditions. The occurrence of locally confined to semi-confined aquifer conditions and local communication with underlying bedrock is possible but is not defined due to the lack of data. Data also indicate the existence of locally occurring saturated soils of higher permeability (dominantly silts and sands) as noted in Section 6.1.2. Apparently, the saturated zone ranges in thickness from 3 ft (at PZ-6) to 8.5 (at PZ-5) ft. The apparent water table flows from the north to the southeast direction, generally in the same direction as the slope of the underlying bedrock surface and overlying topography. Generally, in Site 7 Fuel Hydrant Pipeline, groundwater flows with an approximated hydraulic gradient of 0.088 ft/ft, based on Figure 6-4. The thickness and areal extent of the occurrence of groundwater is not defined, but is inferred on Figure 6-10.

Based on the sporadic occurrences of groundwater within the thin overburden soils, it is unlikely that a well installed in these soils could sustain year-round withdrawals in amounts equal to, or greater than, 200 gallons per day. The results of this qualitative evaluation suggest that the overburden soils do not appear to fit the definition of an aquifer as defined by Act 2 criteria.

6.2.2 Field Screening Analytical Results

During the 1994 field effort, on-site GC screening was conducted on soil gas, groundwater, and soil samples. During the 1995 field effort soil gas and soil samples were screened. All soil gas, groundwater, and soil screening samples were collected and screened using the methods described in Section 4.0. The analytical results are summarized below.

The locations of the temporary piezometers are shown on Figure 4-2. The field data collected from the temporary piezometers indicates that the occurrence of groundwater is inconsistent. Apparently, a continuous groundwater aquifer does not occur in the overburden soils at the base, as indicated by the lack of measurable water in piezometer PZ-4 (total depth of 9.5 ft bgs). However, water levels measured at the other 5 piezometers indicate that water is present in some areas. These are areas where soil conditions are more permeable or the area is covered with asphalt or concrete, with water occurring at accumulation depths of 2 to 5 ft bgs. The occurrence of water in the subsurface is directly related to the near-surface infiltration of surface water accumulating in areas between asphalt and concrete and in the sub-bases of the asphalt and concrete.

6.2.2.1 Field Screening Soil Gas Results

Soil gas results are presented on Figure 6-11, which shows 1994 data, and Figure 6-12 which shows 1995 data. Of the 41 soil gas samples analyzed on-site, one sample (SG-50), located at Hydrant Pit #5, had a benzene concentration of 3.3 ppm. Toluene concentrations ranged from 0.60 to 67 ppm in the soil gas sample. The highest concentration was detected at SG-62 located at the end of the fuel hydrant pipeline. Ethylbenzene was detected in only one sample, SG-51, at 65 ppm, located along the fuel hydrant pipeline by Hydrant Pit #9. Total xylenes were detected in ten samples in concentrations ranging from 1.4 to 310 ppm, with the highest concentration detected at SG-45, located along the fuel hydrant pipeline.

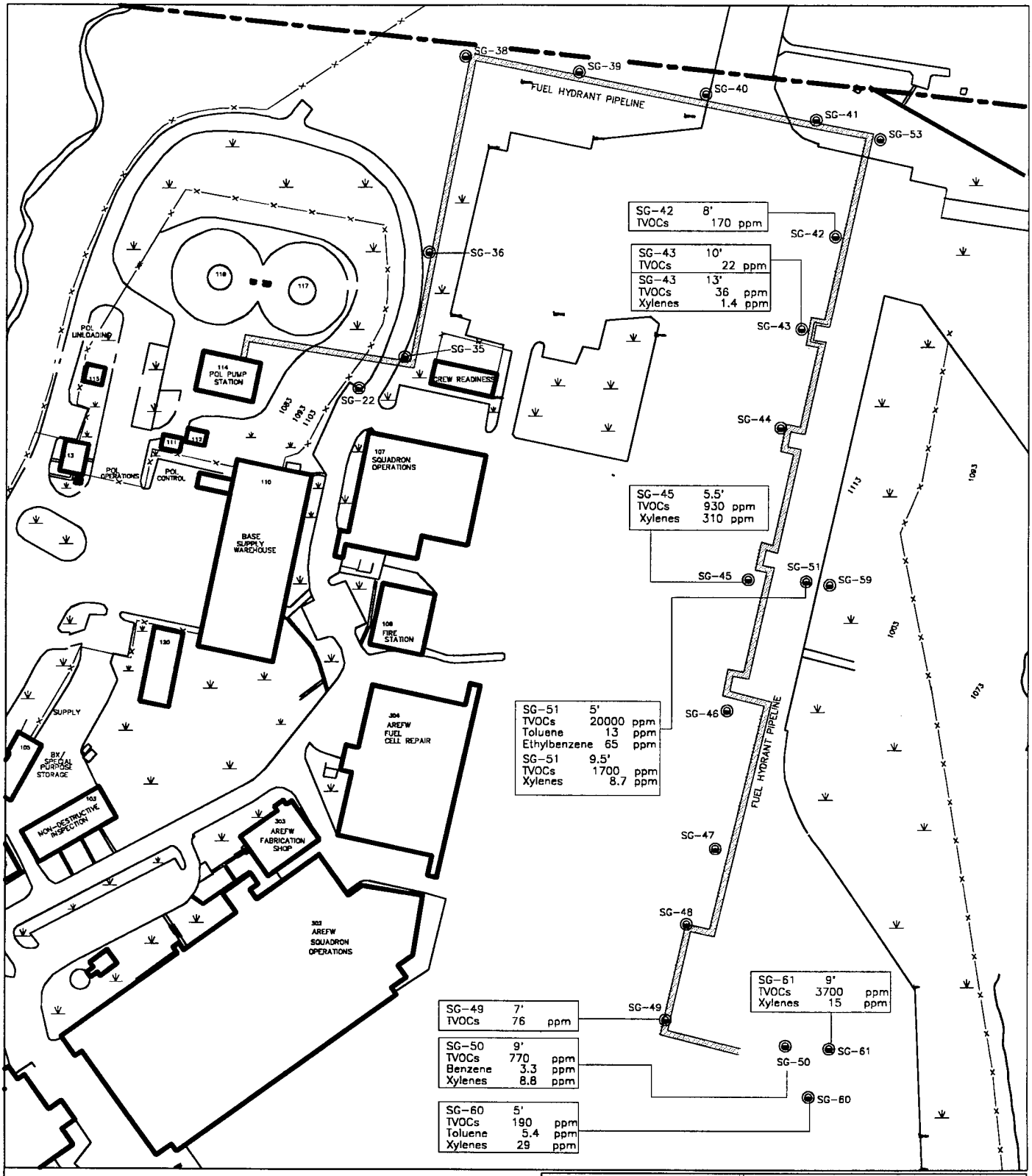


FIGURE 6-11

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – FUEL HYDRANT PIPELINE
SOV SURVEY RESULTS 1994
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT

1/96

FIG6_06.DWG 10/95

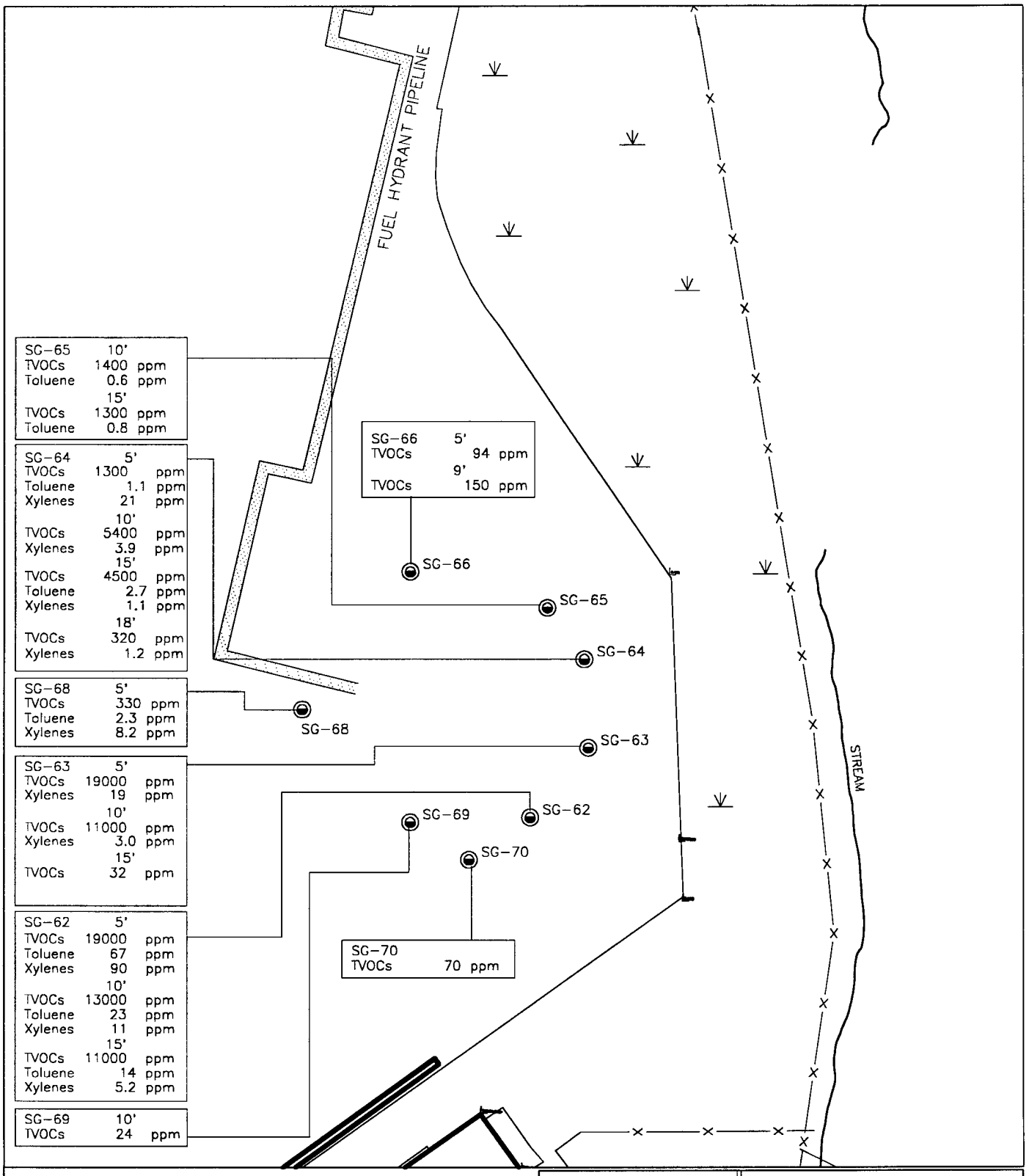


FIGURE 6-12
EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – FUEL HYDRANT PIPELINE
SOV SURVEY RESULTS 1995
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT

1/96

PFIG6-07.DWG 10/95

Total volatiles, as JP-4, were detected in 29 samples in concentrations ranging from 22 to 20,000 ppm. The highest concentration of total volatiles was detected at SG-51. Other locations at the end of the fuel hydrant pipeline also contained high levels of total volatiles, i.e., greater than 1000 ppm, as shown on Figure 6-12.

6.2.2.2 Field Screening Groundwater Results

Groundwater screening results are shown on Figure 6-13. No chlorinated target compounds were detected in groundwater samples collected in groundwater samples collected along the fuel hydrant pipeline. Benzene was detected at concentrations ranging from 2.5 to 1100 ppb. The highest concentration was detected at SG-60, located approximately 100 ft east of Hydrant Pit #5. The remaining detections were all below 10 ppb. Groundwater sampling location SG-60 also contained the highest concentrations of toluene, total xylenes, and total volatiles (JP-4). Toluene was detected in three samples ranging in concentrations from 2.9 to 1300 ppb. Total xylenes were detected in four samples ranging from 9.1 to 4600 ppb. Total volatiles were detected in seven samples at concentrations ranging from 35 to 10,000 ppb.

6.2.2.3 Field Screening Soil Results

Toluene was detected at three sample locations (SG-15, SG-16 and SG-17) at concentrations ranging from 6.0 ppb to 400 ppb. All three of these locations are located east of Hydrant Pit #5. Total volatiles were detected in all of the ten soil screening samples, except for sample locations SG-52 for the 10 to 11 ft bgs sample and SB-17 for the 11-13 ft bgs sample. Concentrations ranged from 55 to 21,000 ppb, with the highest concentration detected at SB-15. The distribution of total volatiles for the 1994 and 1995 soil screening results are shown on Figure 6-14.

6.2.3 Soil Confirmation Results

Nine soil samples from seven locations (7-B07 through 7-B13) were collected during the 1994 field effort along the fuel line. In the 1995 field effort eight soil samples were collected from 5 borings (7-B15 through 7-B19). The 17 samples were submitted for Level C analyses of BTEX and TPH. Table 6-4 summarizes the analytical results. Sample locations, along with concentrations of all detected organic compounds, are shown on Figure 6-15.

6.2.3.1 Laboratory BTEX Results

No BTEX concentrations were detected in any of the soil samples.

6.2.3.2 Laboratory TPH Results

Five samples had concentrations of TPH-diesel in levels ranging from 8 to 51 ppm. The highest concentration of TPH-diesel was detected at 7-B08 at a depth of 9 to 11 ft bgs, located adjacent to SG-43, by Hydrant Pit #9. These levels are all below the ARAR.

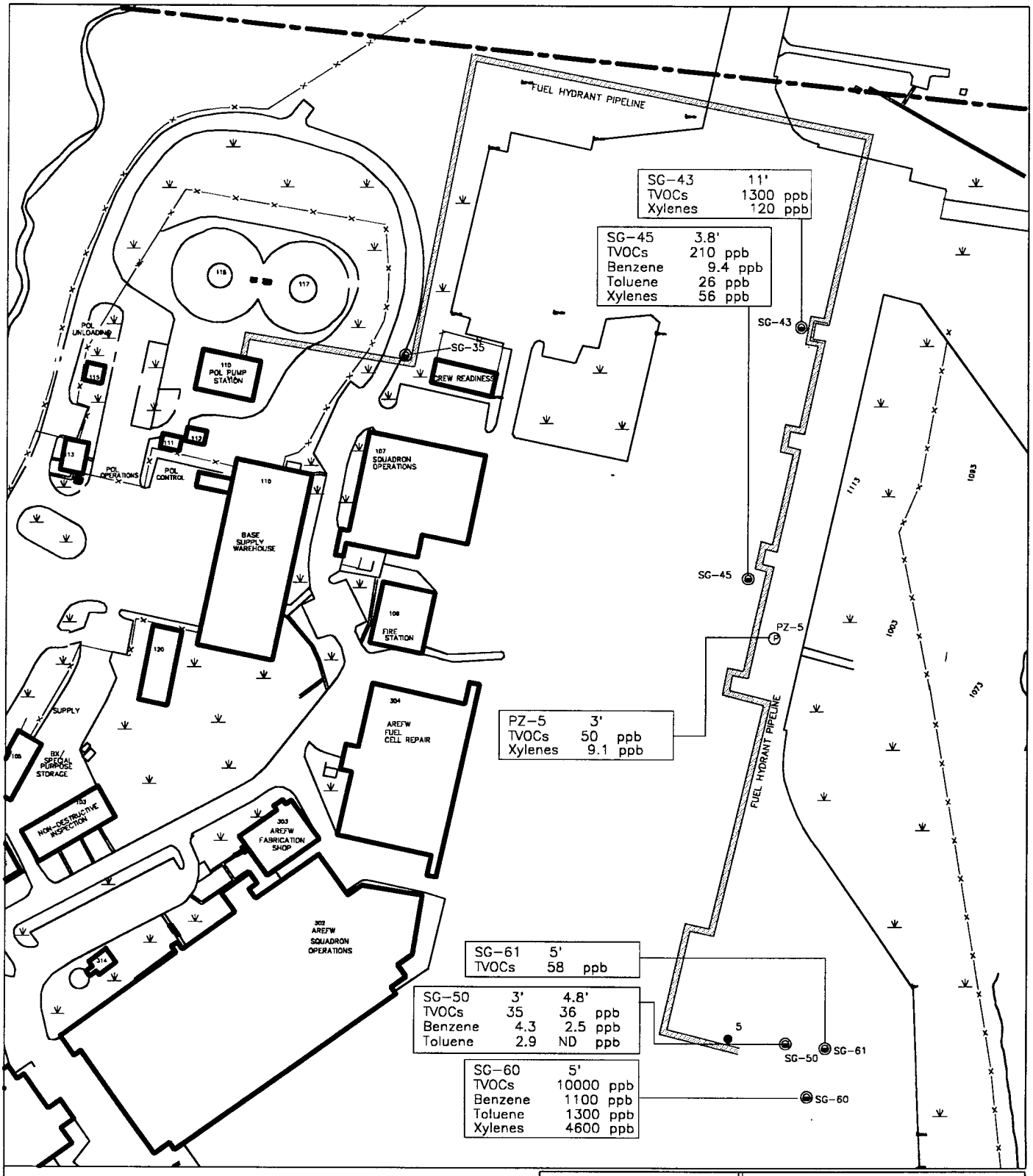


FIGURE 6-13

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – FUEL HYDRANT PIPELINE GROUNDWATER SCREENING RESULTS PENNSYLVANIA AIR NATIONAL GUARD PITTSBURGH INTERNATIONAL AIRPORT

1/96

PFIG6-09.DWG 10/95

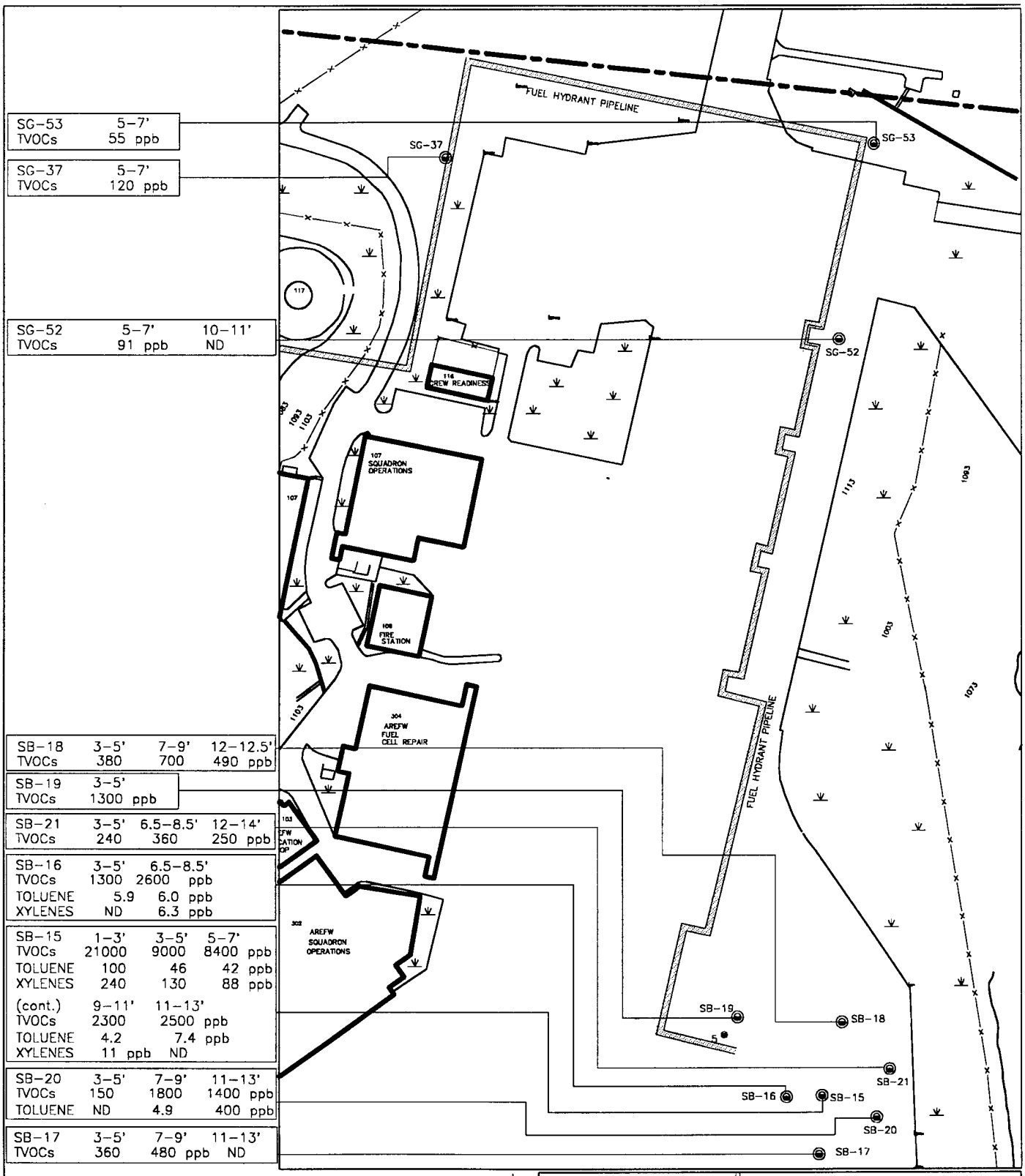


FIGURE 6-14

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – FUEL HYDRANT PIPELINE
SOIL SCREENING RESULTS
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT

1/96

FIG6_11.DWG 10/95

Table 6-4 Site 7: Fuel Hydrant Pipeline Data Summary Table
171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

LOCATOR:		7-B07		7-B08		7-B09		7-B10		7-B11		7-B11	
SAMPLE ID:		P-S7-B07-0507		P-S7-B08-0911		P-S7-B09-0305		P-S7-B10-0305		P-S7-B11-0305		P-S7-B11-0709	
COLLECTION DATE:		11/15/94		11/15/94		11/15/94		11/16/94		11/16/94		11/16/94	
ASSOCIATED QC:		P-S7-TB1-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB1-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB1-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116	
CRITERIA[1]	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
TPH by SW-846 Method 8015 Modified California LUFT													
TPH-diesel	500 mg/kg	28 mg/kg		51 mg/kg		36 mg/kg		11 mg/kg	B	11 mg/kg	()B	7.20 mg/kg	()B
TPH-gasoline	500 mg/kg	-		-		-		-		-		-	

Sample IDs ending with D are duplicate samples

mg/kg milligrams/kilogram
- Analysis not performed
[1] Criteria is Pennsylvania Department of Environmental Protection Act 2 standard.

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Possible blank contamination
J Reported value is estimated
U Compound analyzed for but not detected

Table 6-4 (Continued) Site 7: Fuel Hydrant Pipeline Data Summary Table
171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

LOCATOR:		7-B11		7-B12		7-B12		7-B12		7-B13		7-B15	
SAMPLE ID:		P-S7-B11-0709D		P-S7-B12-0305		P-S7-B12-0305D		P-S7-B12-0709		P-S7-B13-0406		P-S7-B15-0305	
COLLECTION DATE:		11/16/94		11/16/94		11/16/94		11/16/94		11/16/94		08/29/95	
ASSOCIATED QC:		P-S7-TB2-1116,P-S7-EB1-1115 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1115 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1115 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1115 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1115 S7-FB1-1116,S7-FB2-1116		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195	
	CRITERIA[1] UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
TPH by SW-846 Method 8015 Modified California LUFT													
TPH-diesel	500 mg/kg	10 mg/kg	()B	5.20 mg/kg	()B	6.20 mg/kg	()B	8.90 mg/kg	()B	5.40 mg/kg	()B	11 mg/kg	U
TPH-gasoline	500 mg/kg	-		-		-		-		-		1.30 mg/kg	J

Sample IDs ending with D are duplicate samples

mg/kg milligrams/kilogram
- Analysis not performed
[1] Criteria is Pennsylvania Department of Environmental Protection Act 2 standard.

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Possible blank contamination
J Reported value is estimated
U Compound analyzed for but not detected

Table 6-4 (Continued) Site 7: Fuel Hydrant Pipeline Data Summary Table
171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

LOCATOR:		7-B16		7-B16		7-B17		7-B17		7-B18		7-B18	
SAMPLE ID:		P-S7-B16-0305		P-S7-B16-6585		P-S7-B17-0305		P-S7-B17-0709		P-S7-B18-0305		P-S7-B18-0305D	
COLLECTION DATE:		08/29/95		08/29/95		08/29/95		08/29/95		08/29/95		08/29/95	
ASSOCIATED QC:		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195	
	CRITERIA[1] UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
TPH by SW-846 Method 8015 Modified California LUFT													
TPH-diesel	500 mg/kg	13 mg/kg		12 mg/kg	U	11 mg/kg	U	8 mg/kg	()	11 mg/kg	U	12 mg/kg	U
TPH-gasoline	500 mg/kg	0.12 mg/kg	J	0.11 mg/kg	()J	0.11 mg/kg	U	0.11 mg/kg	U	0.11 mg/kg	U	0.12 mg/kg	U

Sample IDs ending with D are duplicate samples

mg/kg milligrams/kilogram
- Analysis not performed
[1] Criteria is Pennsylvania Department of Environmental Protection Act 2 standard.

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Possible blank contamination
J Reported value is estimated
U Compound analyzed for but not detected

Table 6-4 (Continued) Site 7: Fuel Hydrant Pipeline Data Summary Table

171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

LOCATOR:		7-B18		7-B19	
SAMPLE ID:		P-S7-B18-12125		P-S7-B19-0305	
COLLECTION DATE:		08/29/95		08/29/95	
ASSOCIATED QC:		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195	
	CRITERIA[1] UNITS:	RESULT	QUAL	RESULT	QUAL
TPH by SW-846 Method 8015 Modified California LUFT					
TPH-diesel	500 mg/kg	11 mg/kg	U	11 mg/kg	U
TPH-gasoline	500 mg/kg	0.11 mg/kg	U	0.11 mg/kg	U

Sample IDs ending with D are duplicate samples

mg/kg milligrams/kilogram

\- Analysis not performed

† Criteria is Pennsylvania Department of Environmental Protection Act 2 standard.

Data Validation Qualifiers

() Result is between the detection limit and the quantitation limit

B Possible blank contamination

J Reported value is estimated

U Compound analyzed for but not detected

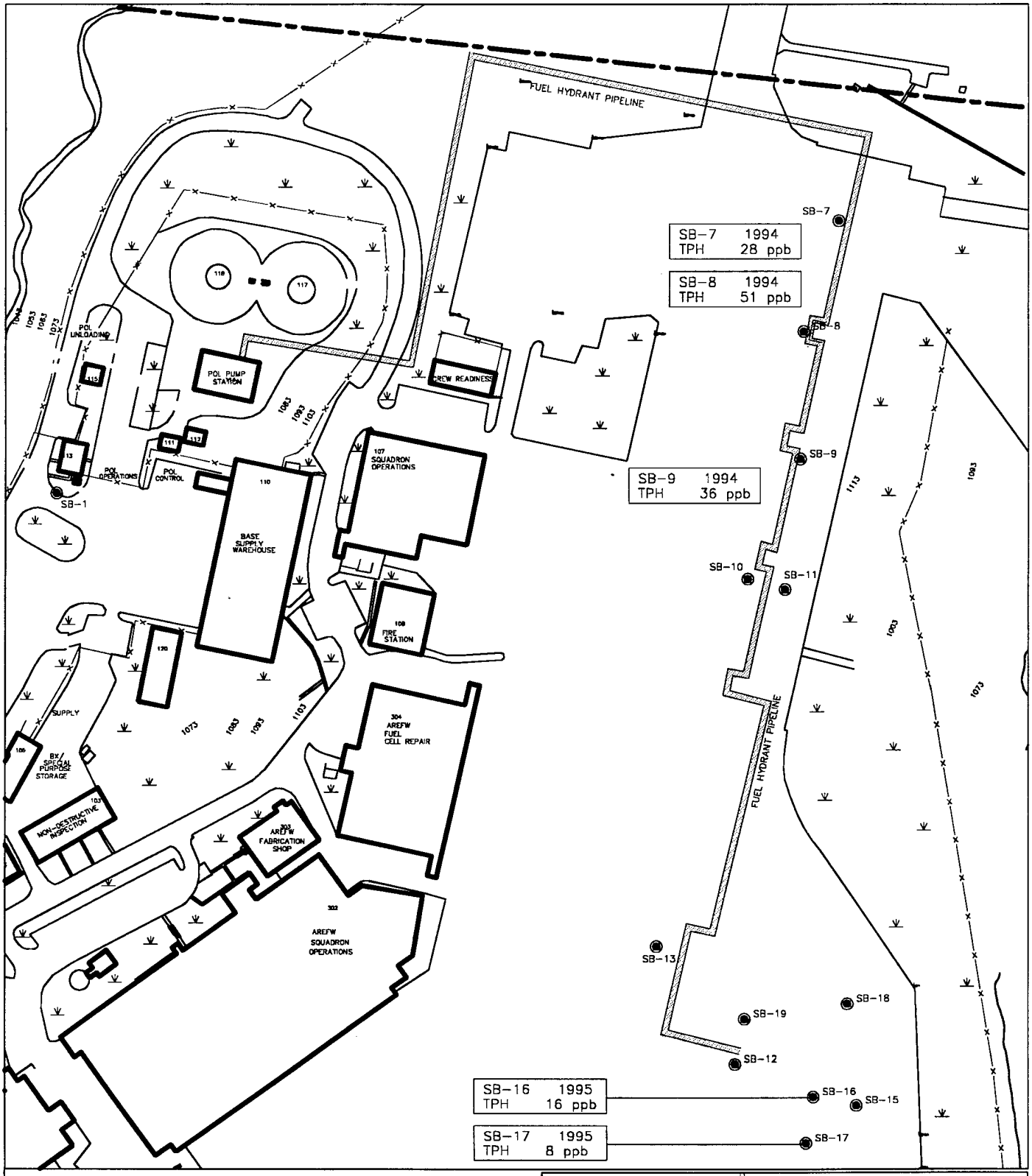


FIGURE 6-15

EARTH TECH

INSTALLATION RESTORATION PROGRAM
171st AIR REFUELING WING
CORAOPOLIS, PENNSYLVANIA

SITE 7 – FUEL HYDRANT PIPELINE SOIL CONFIRMATION RESULTS PENNSYLVANIA AIR NATIONAL GUARD PITTSBURGH INTERNATIONAL AIRPORT

1/96

PFIG6_14.DWG 10/95

6.3 INVESTIGATION-DERIVED WASTE DISPOSITION

1994

The purge/decontamination water only contained a detected amount of TPH-diesel at 3 ppb. The screening results of soils indicated detected levels of benzene, toluene, and ethylbenzene, and total volatiles (as JP-4). Benzene was detected in only two of the nine samples collected, at concentrations of 4.5 ppb and 370 ppb. Toluene was detected in three samples at concentrations ranging from 11 to 330 ppb. Total xylenes were also detected in three sample concentrations ranging from 34 to 640 ppb. Total volatiles were detected in six of the nine sample with concentrations ranging from 55 to 5400 ppb.

1995

The decontamination water contained no detected levels of any target compounds. The composite waste soil sample contained detected levels of toluene at 7.9 ppb, total xylenes at 7.7 ppb, and total volatiles at 640 ppb. The detected levels of target compounds in all of the investigation derived waste are below respective ARARS. The analytical results from both the laboratory and on-site screening were provided to the Base point of contact so that the waste could be disposed of in accordance with Federal, state, and local regulations.

7.0 CONCLUSIONS

The following conclusions were based on the data collected and analyzed during the SI conducted at Site 7 of the 171st ARW, Pennsylvania ANG.

Volatile compounds in soil, indicated by detections of BTEX, are typically present in soils recently contaminated by fuel products. No BTEX were detected in any of the POL Storage Area soil samples. TPH was detected at two locations within the site which are interpreted as being isolated occurrences because the locations are not spatially related. Of the TPH levels detected, all were below PaDER guideline. The product that was released in the 1991 excavation to repair the broken water line near Building 114 was not detected in the SI. No organic compounds were identified in the sediment of McClarens Run, which was analyzed to determine whether potential contaminants had migrated from the POL Storage Area. Based on the lack of BTEX and the low concentrations of TPH-diesel, there does not appear to be significant fuel contamination of the soil.

It was suspected that soil along the Fuel Hydrant Pipeline was contaminated with fuel based on former analyses that had been completed. The concentrations of TPH detected at that time were above the PaDER guideline. This guideline has since then been increased. Even so, the levels of TPH detected during this SI are well below the 1991 guideline. Where petroleum contaminants were previously detected in 1991, no BTEX was detected during the SI. It can only be proposed that the fuel concentrations in the soil have diminished, perhaps through volatilization, during the four year period from when it was originally detected. No fuel contamination appears to be present in Site 7 soils or at the end of the Fuel Hydrant Pipeline.

The scope of the SI for Site 7 did not include investigation of the groundwater. However, groundwater encountered during the screening activities was collected and screened using the on-site GC. Groundwater screening analyses indicated concentrations of BTEX at both the POL Storage Area and along the Fuel Hydrant Pipeline located along the west aircraft parking apron. Total volatile organics were also detected along the Fuel Hydrant Pipeline. The groundwater is not defined as an aquifer with the potential for use as drinking water or for agricultural purposes. Also, the locations where concentrations of BTEX and total volatile organics were detected in the groundwater occurring in the overburden soils is covered by concrete or asphalt.

8.0 RECOMMENDATIONS

Based upon the conclusions presented above, no further action is recommended for Site 7.

9.0 REFERENCES

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Appendix A: Field Change Request Forms

Figure 4-6

The Earth Technology Corporation

Field change No. 1
Page 1 of 1

Field Change Request

Project name 171st ARW, Pennsylvania ANG Project Number 948902
Applicable Document Site Inspection WP & SAP Date Sept 1994

Description: In Geoprobe boreholes that formation is too tight (impermeable) to obtain a soil gas sample, take a soil sample instead.

Minor change [X] Major change [ ] Major project impact [ ]

Requested by: Wade Kirby

Reason for change:
This site is apparently not conducive for soil gas based on analytical work for 1½ days. Soil samples are more representative.

Recommended disposition:
Collect soil samples in acetate liners in areas where formation is too impermeable for soil gas samples

Impact on present and completed work:
No time or cost impact

Accepted [X] Rejected [ ] Signature _____ Project Manager Date 11-94

Accepted [X] Rejected [ ] Signature _____ Project QA/QC Officer Date _____

(Required prior to implemenation of major changes)

Accepted [ ] Rejected [ ] Signature _____ Program Manager Date _____

Accepted [ ] Rejected [ ] Signature _____ Program QA/QC Officer Date _____

(Required prior to implementation of changes with major project impact)

Approved [X] Rejected [ ] Signature L. E. White CLIENT Project Manager Date 1-17-96

Final Disposition _____

Signature _____ Date _____

Form3E-1
6/30/89

Figure 4-6

The Earth Technology Corporation

Field change No. 2
Page 1 of 1

Field Change Request

Project name 171st ARW, Pennsylvania ANG Project Number 948902
Applicable Document Site Inspection WP & SAP Date Sept. 1994

Description: Eliminate the following soil gas locations:
P-97-SB09, -SB-21, -SB13, -SB28, & -SB27

Minor change [X] Major change [ ] Major project impact [ ]

Requested by: Wade Kirby

Reason for change:
These soil gas locations are downgradient from the source area. Soil gas samples between these locations and the source did not show detections; therefore additional soil gas samples are not needed downgradient.

Recommended disposition:
Eliminate the soil gas samples in the referenced downgradient locations.

Impact on present and completed work:
No impact on time or cost

Accepted [X] Rejected [ ] Signature _____ Date 11-94
Project Manager

Accepted [ ] Rejected [ ] Signature _____ Date _____
Project QA/QC Officer

(Required prior to implemenation of major changes)

Accepted [ ] Rejected [ ] Signature _____ Date _____
Program Manager

Accepted [ ] Rejected [ ] Signature _____ Date _____
Program QA/QC Officer

(Required prior to implementation of changes with major project impact)

Approved [X] Rejected [ ] Signature _____ Date 1-17-96
CLIENT Project Manager

Final Disposition _____

Signature _____ Date _____

Form3E-1
6/30/89

Figure 4-6

The Earth Technology Corporation

Field change No. 3
Page 1 of 1

Field Change Request

Project name Pittsburgh IAP - PANG 171ST ARW Project Number 94E902-04

Applicable Document WP ADDENDUM EARTH TECH (AUGUST 1995) Date 9/23/95

Description: Increase in the number of screening and confirmation locations and samples.

Minor change [X] Major change [ ] Major project impact [ ]

Requested by: Patrick H Lay

Reason for change:
To further delineate possible contamination at the end of the fuel hydrant line for future construction of a fuel test cell building

Recommended disposition:
Concurrence of the collection and analysis of extra samples for Pb

Impact on present and completed work:
Increase in time required to complete field activities, but will be within initially budgeted time. Also, an increase in number of samples will exceed number of samples for associated QA/QC requirements of Rinsates (1 in 10).

Accepted [X] Rejected [ ] Signature _____ Project Manager Date 9-95

Accepted [ ] Rejected [ ] Signature _____ Project QA/QC Officer Date _____

(Required prior to implemenation of major changes)

Accepted [ ] Rejected [ ] Signature _____ Program Manager Date _____

Accepted [ ] Rejected [ ] Signature _____ Program QA/QC Officer Date _____

(Required prior to implementation of changes with major project impact)

Approved [X] Rejected [ ] Signature L E White CLIENT Project Manager Date 1-17-96

Final Disposition _____

Signature _____ Date _____

Form3E-1
6/30/89

Figure 4-6

The Earth Technology Corporation

Field change No. 4
Page 1 of 1

Field Change Request

Project name Pittsburgh IAP PANG 171st ARW Project Number 948902-04

Applicable Document WP Final Draft Sept 1994 and WP addendum August 1995 Date 9/23/95

Description: Increase in analysis suite for field blanks; to include SVOCs and PP METALS

Minor change [✓] Major change [ ] Major project impact [ ]

Requested by: Patrick H Lay

Reason for change:
To further characterize field blanks for associated QA/QC rinsates for accompanying work (field activities) for the AREAS of CONCERN A and B.

Recommended disposition:
Concurrence of the analysis of SVOCs and PP METALS

Impact on present and completed work:
Increase in cost is minor. Extra data will help the completeness of the data collected.

Accepted [X] Rejected [ ] Signature [signature] Project Manager Date 1-96

Accepted [ ] Rejected [ ] Signature _____ Project QA/QC Officer Date _____

(Required prior to implemenation of major changes)

Accepted [ ] Rejected [ ] Signature _____ Program Manager Date _____

Accepted [ ] Rejected [ ] Signature _____ Program QA/QC Officer Date _____

(Required prior to implementation of changes with major project impact)

Approved [X] Rejected [ ] Signature L. E. White CLIENT Project Manager Date 1-17-96

Final Disposition _____

Signature _____ Date _____

Form 3E
8 30 89

Appendix B: Field Documentation

The Earth Technology Corporation

Borehole Log

Project Name: ~~Delaware Air National Guard RI~~ Penn. ANG Pittsburgh Int'l Airport		Project Number: ~~911654.06~~ 748702
Borehole Location: Outside Bldg 115, adjacent to 3454	Borehole No. P-57-B01	Sheet 1 of 1
Drilling Agency: Enviroserv	Driller: James Olsen	
Drilling Equipment: Geoprobe ②	Date Started: 11/15/94	Total Depth (feet): 12.5'
Drilling Method: Direct Push	Date Finished: 11/15/94	Depth to Bedrock (feet): 12.5'
Drilling Fluid: None	Number of Samples: 2	Depth to Water (feet):
Completion Information: ~~Grouted to~~ Granular bentonite to the surface	Borehole Diameter (in): 1"	Elevation and Datum:
	Logged by: W. Kirby	
	Checked by:	Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
0											start pushing rods @ 1010
											light rain
2											
4	①		N/A	14"	1010	1	N/A		SW/CL	Sand, brown, f-m, well graded, cemented Clay, brown, moist, weathered shale	Collected soil sample P-57-B01-0406 for Level C analysis
6											
8											
10	②		N/A	16"	1045		N/A		CL	Clay, brown, 10% silt, dry, weathered bedrock	Collected soil sample. P-57-B01-0911 for Level C analysis
											Refusal @ 12.5'
12											TD @ 12.5'

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone;
BG = Background; BH = Borehole Headspace

The Earth Technology Corporation

Borehole Log

Project Name: ~~Delaware Air National Guard Fl~~ Penn ANG Pittsburgh Int'l Airport		Project Number: ~~911654-06~~ 94B902	
Borehole Location: Outside POL, adjacent to SG20	Borehole No.: P-57-B02	Sheet 1 of 1	
Drilling Agency: Enviroserv	Driller: James Olsen		
Drilling Equipment: Geoprobe®	Date Started: 11/16/94	Total Depth (feet): 9	
Drilling Method: Direct Push	Date Finished: 11/16/94	Depth to Bedrock (feet):	
Drilling Fluid: None	Number of Samples: 2	Depth to Water (feet):	
Completion Information: Granular bentonite to bottom of asphalt; cold patch on asphalt surface	Borehole Diameter (in): 1"	Elevation and Datum:	
	Logged by: W. Kirby		
	Checked by:	Date:	

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
2											
4	1		N/A	4"	~~1630~~ 1630		N/A		CH	Clay, medium gray, high plasticity, some black organics, plant material(?)	Collected soil sample P-57-B02-0305 for Level C analysis
6											
8	2		N/A		1645		N/A		ML	Silt, light brown, hard some iron staining, high plasticity	Collected soil sample P-57-B02-0709 for Level C analysis
10											TD@ 9'
12											

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone; BG = Background; BH = Borehole Headspace

The Earth Technology Corporation

Borehole Log

Project Name: ~~Delaware Air National Guard Rt~~ Penn Ang Pittsburgh Int'l Airport

Project Number: ~~91854.06~~ 94B702

Borehole Location: Inside POL, North of Bldg 114, Adjacent to SG25

Borehole No. P-57-B04

Sheet 1 of 1

Drilling Agency: Enviroserv

Driller: James Olsen

Drilling Equipment: Geoprobe®

Date Started: 11/16/94

Total Depth (feet): 5

Drilling Method: Direct Push

Date Finished: 11/16/94

Depth to Bedrock (feet):

Drilling Fluid: None

Number of Samples: 1

Depth to Water (feet):

Completion Information: Granular bentonite to the surface

Borehole Diameter (in): 1"

Elevation and Datum:

Logged by: W. Kirby

Checked by:

Date:

Depth (feet)	Sample Number	Sample Interval	Sample Blow Count	Sample Recovery	Sample Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
2											
4	(1)		N/A		1605		N/A		CL	Clay, dark gray, hard, moist, weathered pieces of shale	Collected soil sample P-57-B04-0505 for Level C analysis
6											TD @ 5'
8											
10											
12											

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone; BG = Background; BH = Borehole Headspace

The Earth Technology Corporation*

Borehole Log

Project Name: ~~Delaware Air National Guard Fl~~ Penn ANG Pittsburgh Int'l Airport		Project Number: ~~911654-06~~ 946702
Borehole Location: Inside POL area, near SG16	Borehole No. P-57-B05	Sheet 1 of 1
Drilling Agency: Enviroserv	Driller: James Olsen	
Drilling Equipment: Geoprobe®	Date Started: 11/16/94	Total Depth (feet): 5
Drilling Method: Direct Push	Date Finished: 11/16/94	Depth to Bedrock (feet):
Drilling Fluid None	Number of Samples: 1	Depth to Water (feet):
Completion Information: Granular bentonite to bottom of concrete, capped with concrete	Borehole Diameter (in): 1"	Elevation and Datum:
	Logged by: W. Kirby	
	Checked by:	Date:

Depth (feet)	Sample Number	Sample Interval	Sample Blow Count	Sample Recovery	Sample Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
2	1		N/A		1520			N/A	ML	Silt, light brown, hard, dry	Collected soil sample P-57-B05-0305 for Level C analysis
4											TD @ 5'
6											
8											
10											
12											

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone; BG = Background; BH = Borehole Headspace

The Earth Technology Corporation

Borehole Log

Project Name: ~~Delaware Air National Guard Fl~~ Penn ANG Pittsburgh Int'l Airport		Project Number: ~~911654-06~~ 966902	
Borehole Location: Inside POL area, NE corner of Bldg 114, adjacent to SG-57	Borehole No. P-57-B06	Sheet 1 of 1	
Drilling Agency: Enviroserv	Driller: James Olsen		
Drilling Equipment: Geoprobe®	Date Started: 11/16/94	Total Depth (feet): 9	
Drilling Method: Direct Push	Date Finished: 11/16/94	Depth to Bedrock (feet):	
Drilling Fluid None	Number of Samples: 2	Depth to Water (feet):	
Completion Information: Granular bentonite to the surface	Borehole Diameter (in): 1"	Elevation and Datum:	
	Logged by: W. Kirby		
	Checked by:	Date:	

Depth (feet)	Sample Number	Sample Interval	Sample Blow Count	Sample Recovery	Sample Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
2											
4	1		N/A		1545		N/A		CH	Clay, brown w/ yellowish red staining, high plasticity, moist	Collected soil sample P-57-B06-0305 for Level C analysis
6										Clay, yellowish-red brown, high plasticity, moist	Collected soil sample P-57-B06-0705 for Level C analysis
8	2		N/A		1555		N/A		CH		TD @ 9'
10											
12											

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone;
BG = Background; BH = Borehole Headspace

The Earth Technology Corporation

Borehole Log

Project Name: ~~Delaware Air National Guard Fl~~ Penn ANG Pittsburgh Int'l Airport		Project Number: ~~91165A-08~~ 94E902
Borehole Location: Flightline, adjacent to SG42	Borehole No. P-57-B07	Sheet 1 of 1
Drilling Agency: Enviro Surv	Driller: James Olsen	
Drilling Equipment: Geoprobe ©	Date Started: 11/15/94	Total Depth (feet): 7
Drilling Method: Direct Push	Date Finished: 11/15/94	Depth to Bedrock (feet):
Drilling Fluid None	Number of Samples: 1	Depth to Water (feet):
Completion Information: Granular bentonite to concrete, capped w/ concrete	Borehole Diameter (in): 1"	Elevation and Datum:
	Logged by: W. Kirby	
	Checked by:	Date:

Depth (feet)	Sample Number	Sample Interval	Sample Blow Count	Sample Recovery	Sample Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
2											
4											
6	①		N/A	16"	1235	N/A			CL	Clay, tan to reddish brown, dry, weathered bedrock	Collected soil sample P-57-B07-0507 for Level C analysis; shale at bottom of sampler
8											TD @ 7'
10											
12											

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone; BG = Background; BH = Borehole Headspace

The Earth Technology Corporation

Borehole Log

Project Name: ~~Delaware Air National Guard RI~~ Penn ANG Pittsburgh Int'l Airport		Project Number: ~~911854-00~~ 948902
Borehole Location: Flightline, adjacent to SG43	Borehole No. P-57-B08	Sheet 1 of 1
Drilling Agency: Enviroserv	Driller: James Olsen	
Drilling Equipment: Geoprobe®	Date Started: 11/15/94	Total Depth (feet): 11
Drilling Method: Direct Push	Date Finished: 11/15/94	Depth to Bedrock (feet):
Drilling Fluid: None	Number of Samples: 2	Depth to Water (feet):
Completion Information: Granular bentonite to concrete, capped w/ concrete	Borehole Diameter (in): 1"	Elevation and Datum:
	Logged by: W. Kirby	
	Checked by:	Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
2											
4	①		N/A			1335	N/A			Weathered bedrock turning to brown to reddish brown clay grading to buff silt	Collected soil sample P-57-B08-0506 for lithology
6											
8										Clay, buff, dry	Collected soil sample P-57-B08-0911 for Level C analysis
10	②		N/A			1355	N/A				
12											TD @ 11'

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone; BG = Background; BH = Borehole Headspace

The Earth Technology Corporation*

Borehole Log

Project Name: ~~Delaware Air National Guard RI~~ PennANG Pittsburgh Int'l Airport		Project Number: ~~911654-00~~ 978402	
Borehole Location: Flightline, near S644		Borehole No. P-57-B09	Sheet 1 of 1
Drilling Agency: Envirosure		Driller: James Olsen	
Drilling Equipment: Geoprobe®		Date Started: 11/15/94	Total Depth (feet): 5'
Drilling Method: Direct Push		Date Finished: 11/15/94	Depth to Bedrock (feet):
Drilling Fluid: None		Number of Samples: 1	Depth to Water (feet):
Completion Information: Granular bentonite to concrete, capped w/ concrete		Borehole Diameter (in): 1"	Elevation and Datum:
		Logged by: W. Kirby	
		Checked by:	Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
2	①		N/A	20"	1430		N/A		CL	Clay, buff to medium brown, some coarse grain sand grains, dry, pieces of weathered bedrock	Collected soil sample P-57-B09-0305 for Level C analysis
4											TD @ 5'
6											
8											
10											
12											

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone; BG = Background; BH = Borehole Headspace

The Earth Technology Corporation

Borehole Log

Project Name: ~~Delaware Air National Guard RI~~ Penn ANG Pittsburgh Intl Airport		Project Number: ~~911854.08~~ 948902
Borehole Location: Flightline, adjacent to SG45	Borehole No. P-57-B10	Sheet 1 of 1
Drilling Agency: Enviroserv	Driller: James Olsen	
Drilling Equipment: Geoprobe(tz)	Date Started: 11/16/94	Total Depth (feet): 5'
Drilling Method: Direct Push	Date Finished: 11/16/94	Depth to Bedrock (feet):
Drilling Fluid None	Number of Samples: 1	Depth to Water (feet):
Completion Information: Granular bentonite to concrete, capped w/ concrete	Borehole Diameter (in): 1"	Elevation and Datum:
	Logged by: W. Kirby	
	Checked by:	Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
2	1		N/A	N/A	1020		N/A		ML	Silt, light brown, dry	Collected soil sample P-57-B10-0305 for Lerel Analysis
4											TD @ 5'
6											
8											
10											
12											

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone;
BG = Background; BH = Borehole Headspace

The Earth Technology Corporation

Borehole Log

Project Name: ~~Delaware Air National Guard Fl~~ Penn ANG Pittsburgh Intl Airport		Project Number: ~~911854-08~~ 946402
Borehole Location: Flightline, adjacent to SB51	Borehole No. P-57-B11	Sheet 1 of 1
Drilling Agency:	Driller:	
Drilling Equipment:	Date Started:	Total Depth (feet):
Drilling Method:	Date Finished:	Depth to Bedrock (feet):
Drilling Fluid	Number of Samples:	Depth to Water (feet):
Completion Information:	Borehole Diameter (in):	Elevation and Datum:
	Logged by:	
	Checked by:	Date:

Depth (feet)	Sample Number	Sample Interval	Sample Blow Count	Sample Recovery	Sample Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
2											
4	(1)		N/A	N/A	1056		N/A		CH	Clay, yellowish brown, high plasticity, moist some weathered rock fragments	Collected soil sample P-57-B11-0305 for Level C analysis
6											
8	(2)		N/A	N/A	1100		N/A		ML	Silt, light to medium brown, dry, rock fragments	Collected soil sample P-57-B11-0705 for Level C analysis and duplicate P-57-B30-0705 adjacent to B11
10											TD @ 11'
12											

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone;
BG = Background; BH = Borehole Headspace

The Earth Technology Corporation*

Borehole Log

Project Name: ~~Delaware Air National Guard Rl~~ Penn Ang Pittsburgh Int'l Airport		Project Number: ~~911854-08~~ 948902
Borehole Location: Flightline, adjacent to SG50	Borehole No. P-57-B12	Sheet 1 of 1
Drilling Agency: Enviro Surv	Driller: James Olsen	
Drilling Equipment: Geoprobe®	Date Started: 11/16/94	Total Depth (feet): 9
Drilling Method: Direct Push	Date Finished: 11/16/94	Depth to Bedrock (feet):
Drilling Fluid None	Number of Samples: 2	Depth to Water (feet):
Completion Information: Granular bentonite to concrete, capped w/concrete	Borehole Diameter (in): 1"	Elevation and Datum:
	Logged by: W. Kirby	
	Checked by:	Date:

Depth (feet)	Sample Number	Sample Interval	Sample Blow Count	Sample Recovery	Sample Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
2											
4	①		N/A	N/A	1325		N/A		CH	Clay, olive green, with some black organic material, plant material (?), moist	Collected soil sample P-57-B12-0305 and duplicate sample P-57-B31-0305 for Level C analysis
6											
8	②		N/A	N/A	1335		N/A		ML	Silt, light brown, dry	Collected soil sample P-57-B12-0709 for Level C analysis
10											TD @ 9'
12											

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone;
BG = Background; BH = Borehole Headspace

The Earth Technology Corporation*

Borehole Log

Project Name: ~~Delaware Air National Guard FI~~ Penn ANG Pittsburgh Int'l Airport		Project Number: ~~911654-06~~ 948702
Borehole Location: Flightline, adjacent to SB48	Borehole No. P-57-B13	Sheet 1 of 1
Drilling Agency: Enviroservr	Driller: James Olsen	
Drilling Equipment: Geoprobe ®	Date Started: 11/16/94	Total Depth (feet): 6
Drilling Method: Direct Push	Date Finished: 11/16/94	Depth to Bedrock (feet):
Drilling Fluid None	Number of Samples: 1	Depth to Water (feet):
Completion Information: Granular bentonite to concrete, capped w/concrete	Borehole Diameter (in): 1"	Elevation and Datum:
	Logged by: W. Kirby	
	Checked by:	Date:

Depth (feet)	Sample Number	Sample Interval	Sample Blow Count	Sample Recovery	Sample Time	Field Analysis FID (ppm) S/B*	Field Analysis PID (ppm) S/B*	LOG Graphic	LOG USCS or Rock Type	Lithologic Description	Remarks
2	D		N/A	N/A	1440		N/A		CL	Clay, light brown, hard, dry	Collected soil sample P-57-B13-040 for Level C analysis
4											
6											
8											
10											
12											

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone;
BG = Background; BH = Borehole Headspace

The Earth Technology Corporation

Borehole Log

Project Name: ~~Delaware Air National Guard RI~~ Penn ANG Pittsburgh Int'l Airport		Project Number: ~~911654-06~~ 94890.2
Borehole Location: POL area, top of hill, adjacent to S658	Borehole No. P-57-B14	Sheet 1 of 1
Drilling Agency: Enviroserv	Driller: James Olson	
Drilling Equipment: Geoprobe®	Date Started: 11/16/94	Total Depth (feet): 4
Drilling Method: Direct Push	Date Finished: 11/16/94	Depth to Bedrock (feet): 4
Drilling Fluid: None	Number of Samples: 1	Depth to Water (feet):
Completion Information: Granular bentonite to the surface	Borehole Diameter (in): 1"	Elevation and Datum:
	Logged by: W. Kirby	
	Checked by:	Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
2	①		N/A	N/A	1705				ML	Silt, light brown, dry, weathered bedrock in sleeves	Collected soil sample P-57-B14-0204 for Level C analysis
4											TD @ 4'
6											
8											
10											
12											

KEY: * S/B = Sample Reading / Background Reading; NA = Not Analyzed; BZ = Breathing Zone; BG = Background; BH = Borehole Headspace

EARTH TECH

BOREHOLE LOG

Project Name: Pittsburg ANG 171 ARW/AE SE Field work

Project Number: 948902-04 **Field Log of Borehole Number:** P-7-SB1/SB15 **Sheet** 1 **of** _

Borehole Location: Site 7		**Elevation and Datum:** Land: Top:	
Drilling Agency: Environcurve Inc.	**Driller:** James Olson	**Date Started:** 8/29/95	**Date Finished:** 8/29/95
Drilling Equipment: Geoprobe® 5400 model		**Completion: Depth (feet)**	**Rock Depth: NA (feet)**
Method of Drilling: Direct Push		**Number of Samples:** Dist.: NA	Undist.: NA Core: NA
Borehole Size (inches):		**Water Depth (ft):** First: NA	Compl.: NA 24 hrs. NA
Completion Information:		**Logged By:** Patrick H. Lady	**Checked By:**

Depth (feet)	Samples: Number	Type	Blow Count	Drilling Time	Field Analysis: PID (ppm) S/J/B*	FID (ppm) S/J/B*	Log: Geologic Unit	Graphic	USCS or Rock Type	Description	Remarks
0	P-7-SB1 3-5'	NA	SS Sleeve Acetate			50%			AF	0-1' Concrete at 1' Asphalt wet ~ 2" thick. of Silt moist to sl. moist	0920 1-3' Sample delay
		NA			6.2/0.2					5G4/1 dark greenish gray PL not sl. odor	
		NA							ML/	2-3' Silt w/ clay sand and gravel sl. moist sl. od	
		NA								5y 5/3 olive.	
					1.3/0.2	75%				3-4.5' as above wet to damp.	3-5' Sample 0935
										4.5-5 PL Clay dry to sl. moist	
5									CL	no odor color as above	0945 - sample delivered
					0.2/0.2	50%				5-7' Gravel w/ clay sand and silt. 10 yr 5/4 yellowish Brown no odor dry	
					0.2/0.2	25%			GP/GC	7-9' Gravel - possibly WEATHERED Dry Grey	7-9' Sample 955
									CL/ML		9-11' Sample 1100
					0/0	50%			GP/GS	9-11' Gravel with PL Gravelly clay and silt ~ 3" thick at 8' and 9' bgs	
					0/0	30%			GP	Olive Grey.	11-13' Sample 1115
										11-13' Sample	
									ML	11-12' Rock - gravel grey LS	
										12-13' Clay mottled sl. moist	
										no odor w/ coal pieces	
15										2.5y 7/4 pale yellow	
										TD=13'	
20											

EARTH TECH

BOREHOLE LOG

Project Name: _____

Project Number: _____ **Field Log of Borehole Number:** 7-SB2/SB16 **Sheet** 1 **of** 1

Borehole Location: Site 7 @ SB16		**Elevation and Datum:**	**Land Top:**
Drilling Agency: ENVIROSWAT	**Driller:** J. Olson	**Date Started:** 8/29/95	**Date Finished:** 8/29/95
Drilling Equipment: Geoprobe		**Completion: Depth (feet)**	**Rock Depth: NA (feet)**
Method of Drilling: Direct Push		**Number of Samples:** 2 **Dist.:** NA	**Undist.:** NA **Core:** NA
Borehole Size (inches): 1.5"		**Water Depth (ft):** - **First:** NA	**Compl.:** NA **24 hrs.** NA
Completion Information:		**Logged By:** DHL	**Checked By:**

Depth (feet)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Time	Field Analysis: PID (ppm) S/J/B*	Field Analysis: FID (ppm) S/J/B*	Log: Geologic Unit	Log: Graphic	Log: USCS or Rock Type	Description	Remarks
									AP	0-1' Concrete	1155 PC 1120 Begin
	P-7-SB2-3.5				1.5/0.2	7.2/0.2 60%			SM	3-3.5 Silt and sand dry Sl. Loose. 2.5y 6/4 lt. yellowish Brown no odor	3.5' sample delivered 1130
5	P-7-SB2-6.5-8.5				0.4/0.2	50%			CL GC	3.5-5' Clay and Silt w/ gravel mottled. Sl. possible odor 2.5y 5/3 Light olive Brown Sl. plasticity Sl. moist as above 6.5-8.5	1145 - 6.5-8.5 Sample delivered
									GP	Predominantly gravel 6.5-7.25	
10											
15											
20											

EARTH TECH

BOREHOLE LOG

Project Name: PANG, Pittsburg SE

Project Number: 948902 **Field Log of Borehole Number:** 7-SB3/SB17 **Sheet** 1 **of**

Borehole Location: Site 7 SB3 @ SG70		**Elevation and Datum:** Land: Top:	
Drilling Agency:	**Driller:**	**Date Started:** 8/29/95	**Date Finished:** 8/29/95
Drilling Equipment:		**Completion: Depth (feet)** 13'	**Rock Depth: NA (feet)**
Method of Drilling:		**Number of Samples:** 3 **Dist.:** NA	**Undist.:** NA **Core:** NA
Borehole Size (inches):		**Water Depth (ft):** — **First:** NA	**Compl.:** NA **24 hrs.** N.
Completion Information:		**Logged By:** PH Lay	**Checked By:**

Depth (feet)	Samples: Number	Type	Blow Count	Drilling Time	Field Analysis: PID (ppm) S/J/B*	FID (ppm) S/J/B*	Log: Geologic Unit	Graphic	USCS or Rock Type	Description	Remarks
										0-1' Concrete	
										3-5' Silt and Clay w/ rock fragments/gravel. Sl. moist to dry no apparent odor 2.5y 5/3 light olive Brown	3-5' Sample collected 1355
5					0.3/0	48%					7-9' Sample 14
										7-9' Clay Silt and sand f+c. Sl. moist (moist @ 7.5') 2.5y 6/3 light yellowish Brown	
10					0.0/0	75%					11-13' Sample 14
										11-13' 2.5y 7/4 Pale yellow Silt w/ trace clay and sand dry no odor	
15					0/0	90%				TD=13'	
20											

EARTH TECH

BOREHOLE LOG

Project Name: _____

Project Number: 948902 **Field Log of Borehole Number:** 7-SB4/SB18 **Sheet** 1 **of** 1

Borehole Location: Sites 7 SB4 (at SG 65)		**Elevation and Datum:**	**Land:** / **Top:**
Drilling Agency: Enviroserv Inc	**Driller:** James Olson	**Date Started:** 8/29/95	**Date Finished:** 8/29/95
Drilling Equipment:		**Completion: Depth (feet)** 13'	**Rock Depth: (feet)** NA
Method of Drilling:		**Number of Samples:** 3 / **Dist.:** NA	**Undist.:** NA / **Core:** NA
Borehole Size (inches):		**Water Depth (ft):** / **First:** NA	**Compl.:** NA / **24 hrs.** NA
Completion Information:		**Logged By:** PHZ	**Checked By:**

Depth (feet)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Time	Field Analysis: PID (ppm) S/J/B*	Field Analysis: FID (ppm) @ 10 cm S/J/B*	Log: Geologic Unit	Log: Graphic	Log: USCS or Rock Type	Description	Remarks
										0-1' Concrete	
					0/0	80				3-5 Silt & clay w/ gravel and sand Light Olive Brown 5Y 6/2 slmoist. no odor	3-5' Sample 1450
5					0/0	50				7-9' as above	1510 7-9' Sample
										12-12.5 (12.5) As above. Sl. moist to moist	12-12.5 Sample 1525
10					0/0	25					
15											
20											

EARTH TECH

BOREHOLE LOG

Project Name: _____

Project Number: 948902 **Field Log of Borehole Number:** 7-SB5/SB19 **Sheet** 1 **of** _____

Borehole Location: Site 7 SB5 (at SG65)		**Elevation and Datum:**	**Land:** / **Top:**	
Drilling Agency: Environsurv Inc.	**Driller:** James Olson	**Date Started:** 8/29/95	**Date Finished:** 8/29/95	
Drilling Equipment: Geoprobe 5400 model		**Completion: Depth (feet)** 6'	**Rock Depth: (feet)** NA	
Method of Drilling: Direct Push		**Number of Samples:** 1	**Dist.:** NA	**Undist.:** NA / **Core:** NA
Borehole Size (inches): 1.5		**Water Depth (ft):** NA	**First:** NA	**Compl.:** NA / **24 hrs.** NA
Completion Information: ~~Grout~~ Bentonite granules to ~1' bgs - concrete patch		**Logged By:** Patrick Hlay	**Checked By:**	

Depth (feet)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Time	Field Analysis: PID (ppm) S/J/B*	Field Analysis: FID (ppm) S/J/B*	Log: Geologic Unit	Log: Graphic	Log: USCS or Rock Type	Description	Remarks
									AF	0-1' Concrete	
5	P.7-SB5-3.5				0.0/0.0	5%			PL/ML/CL	3.5' Silt and Clay 5.8g Sl. greenish grey no odor Sl. moist	3-5' Sample 1625
					PL 0					TD 6' Refusal 6'	
10											
15											
20											

Figure 4-4

The Earth Technology Corporation

Borehole Log

Project Name: Pittsburgh IAP PANG 171st ARW SI field work		Project Number: 94892-04
Borehole Location: Site 7 Hydrant fuel line	Borehole No. PS7-SB6/SB20	Sheet 1 of
Drilling Agency: ENVIROSURV	Driller: JAMES OLSON	
Drilling Equipment: Geoprobe 5400 model	Date Started: 8/30/95	Total Depth (feet): 13'
Drilling Method: Direct Push	Date Finished: 8/30/95	Depth to Bedrock (feet): —
Drilling Fluid: none	Number of Samples: 3	Depth to Water (feet):
Completion Information: grouted to surface w/ granular bentonite to = Concrete patch	Borehole Diameter (in): 1.5"	Elevation and Datum:
	Logged by: PH Lee	
	Checked by:	Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
0										0' Concrete	
5	Screen	3-5		50%					ML	3-5' Silt w/ some gravel olive grey to greenish grey Sl. moist to dry	3-5 Sample 10:17
	Screen	7-9		55%					ML	7-9' as above	7-9' Sample 1020
10									ML	11-12.5 Silt and gravel Brown	11-13' Sample 1030
	Screen	11-13		50%					SM	12.5-13' rock fragments	
15										TD = 13'	
										Refusal = 13'	
20											
25											
30											

Key

* S/B = Sample reading / background reading; NA = not analyzed

Form F-100S 9/1/91

Figure 4-4

The Earth Technology Corporation

Borehole Log

Project Name: Pittsburg IAP PANG 171st ARW		Project Number: 945902-04
Borehole Location: Site 7 Hydrant Pipeline	Borehole No. PS7-SB7/SB21	Sheet 1 of 1
Drilling Agency: ENVIROSERV	Driller: JAMES OLSON	
Drilling Equipment: Geoprobe 5400 model	Date Started: 8/30/95	Total Depth (feet): 14'
Drilling Method: Direct Push	Date Finished: 8/30/95	Depth to Bedrock (feet): -
Drilling Fluid: none	Number of Samples: 3	Depth to Water (feet): -
Completion Information: Grouted to surface w/ Granular Bentonite Sealed w/ special concrete patch	Borehole Diameter (in): 1.5"-2"	Elevation and Datum:
	Logged by: PH Lang	
	Checked by:	Date:

Depth (feet)	Sample: Number	Sample: Interval	Sample: Blow Count	Sample: Recovery	Sample: Time	Field Analysis: FID (ppm) S/B*	Field Analysis: PID (ppm) S/B*	LOG: Graphic	LOG: USCS or Rock Type	Lithologic Description	Remarks
0										0' - Concrete	
5	Screen Sleeve	3-5'	-	50%			PID 0/0		ML	3-5' Silt and Gravel Interbedded olive grey dry to sl. moist.	3-5 Spoon delivered 0900
		6.5-8.5		50%					ML	6.5-8.5 Silt w/some rock fragments Olive grey.	6.5-8.5 Spoon delivered 0930
10	Screen			50%					CL/ ML	12-14' Silt and Clay w/ rock fragments	0955 12-14' spoon delivered
15										TD-14'	
20											
25											
30											

Key * S/B = Sample reading / background reading; NA = not analyzed

Form

The Earth Technology Corporation

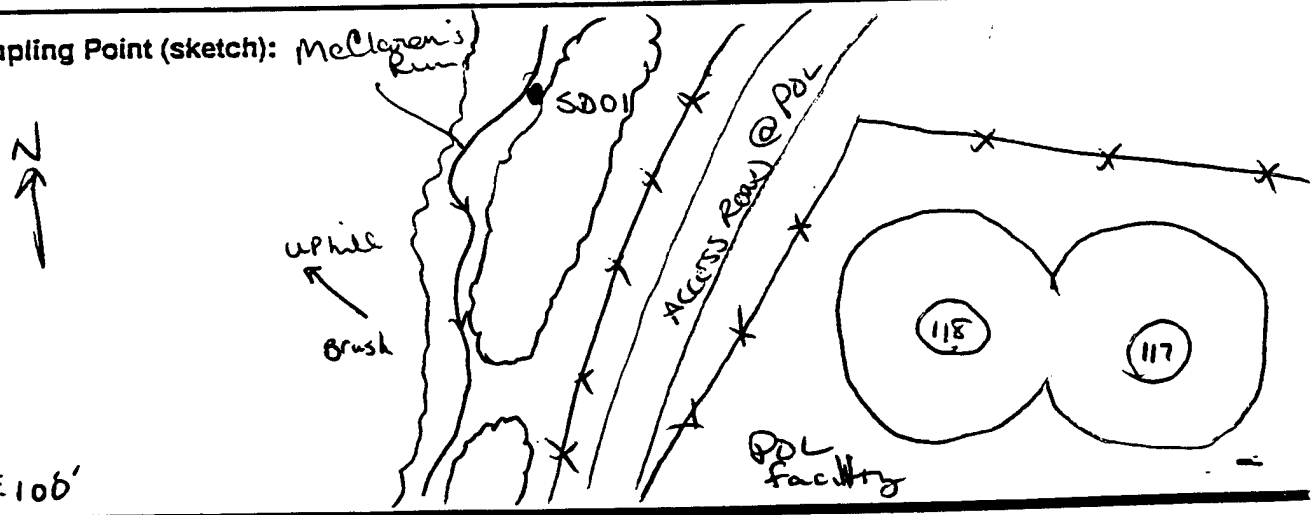
Soil/Sediment Sampling Record

Project Name Pittsburgh ANG 171ST ARW
Project Number 94892
Location Site 7 - POL - McClarens Run
Sample Number P-S7-SD01
Recorded By Patricia Lay for WADE Kirby
Duplicate Number P-S7-SD07
Date 11/17/95 collected
Checked By
Site 7 - POL
Date

Sampling Equipment Stainless Steel Spoon & Bowl Auger
Sample Type Soil (Sediment) Rock

Sample Type Description
USCS Soil Type CL Clay - Sl. mottled
Color Brown & gray
Odor NOT Recorded
Depth 0-0.5
Number of Samples 1 (8)
Comments Collected on Bank of Creek

Sampling Point (sketch):



Decontamination
Equipment: ☒ Hand auger
Type 2"
☐ Trowel
☒ Other PVC Stainless Spoon

Decontamination Fluids: Contaminated for subsequent sampling
☐ Steam/Hot Water
☒ Detergent/water
☐ Potable Water
☒ Deionized Water
☒ Methanol
☐ Hexane
☐ HNO_3 ; dilution
☐ Other Air Dry

Form

Figure

The Earth Technology Corporation

Soil/Sediment Sampling Record

Project Name Pittsburgh ANG 171ST ARW
Project Number 965902
Location Site 7 - POL - McClarens Run
Sample Number D-S7-SD02
Recorded By Patrick Lay for WADE KIRBY
Duplicate Number —
Date 11/17/95 COLLECTED
Checked By
Site 7 - POL
Date

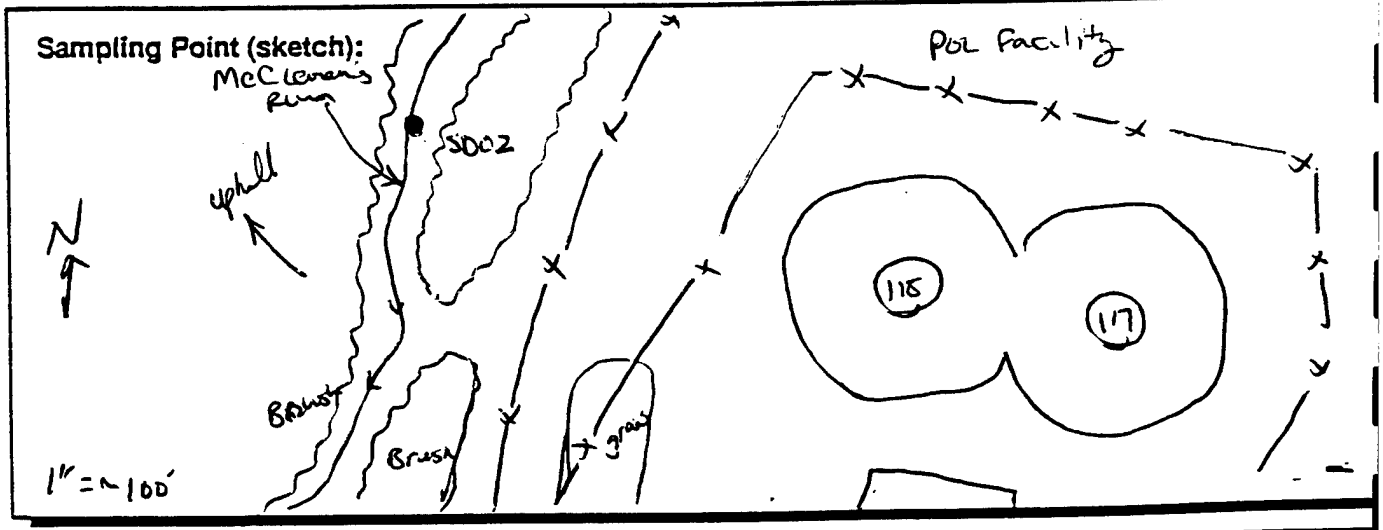
Sampling Equipment Stainless steel trowel

Sample Type Soil (Sediment) Rock

Sample Type Description

USCS Soil Type SP/SW Sand w/ Gravel
Color Brown, WET
Odor not recorded
Depth 0-0.5
Number of Samples 1
Comments Sampled from creek bed

Sampling Point (sketch):



Decontamination

Equipment: ☐ Hand auger
Type
☒ Trowel
☒ Other Stainless Steel Spoon PHL

Decontamination Fluids: Containerized for subsequent sampling
☐ Steam/Hot Water ☒ Methanol
☒ Detergent/water ☐ Hexane
☒ Potable Water ☐ HNO_3 ; dilution
☒ Deionized Water ☒ Other Air Dry

Figure

The Earth Technology Corporation

Soil/Sediment Sampling Record

Project Name Pittsburgh ANGB 171st ARW
Project Number 94SG02
Location Site 7-POL Storage area McClimen's Run
Sample Number P-S7-SD03
Recorded By Patrick HLA, for Wade Kirby
Duplicate Number —
Date 11/17/95 collected
Checked By
Site 7- POL
Date

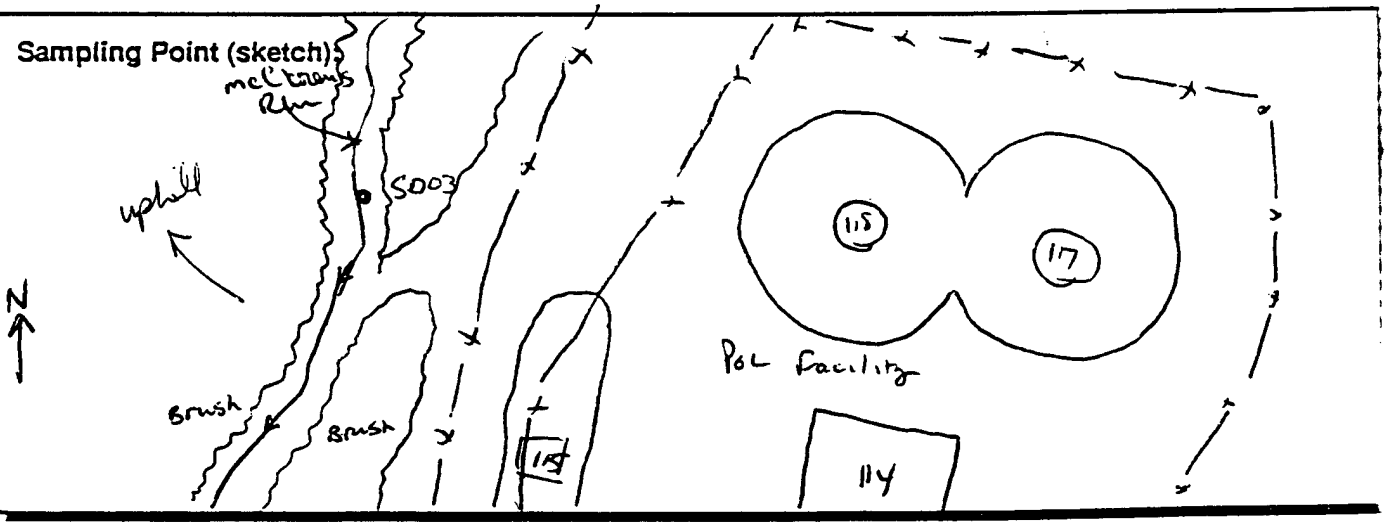
Sampling Equipment ~~Stainless Spoon~~ DHG Trowel

Sample Type Soil (Sediment) Rock

Sample Type Description

USCS Soil Type CL Clay, mottled
Color Black and Brown
Odor not recorded
Depth 0-0.5
Number of Samples 1
Comments Sample collected from creek bed

Sampling Point (sketch):



Decontamination

Equipment: ☐ Hand auger
Type
☒ Trowel
~~☒ Other~~ DHG

Decontamination Fluids: Containerized for subsequent Sampling
☐ Steam/Hot Water ☒ Methanol
~~☒~~ Detergent/water ☐ Hexane
☒ Potable Water ☐ HNO_3 ; dilution
~~☒~~ Deionized Water ☐ Other Air Dry

Form F10

Figure 3-

The Earth Technology Corporation

Soil/Sediment Sampling Record

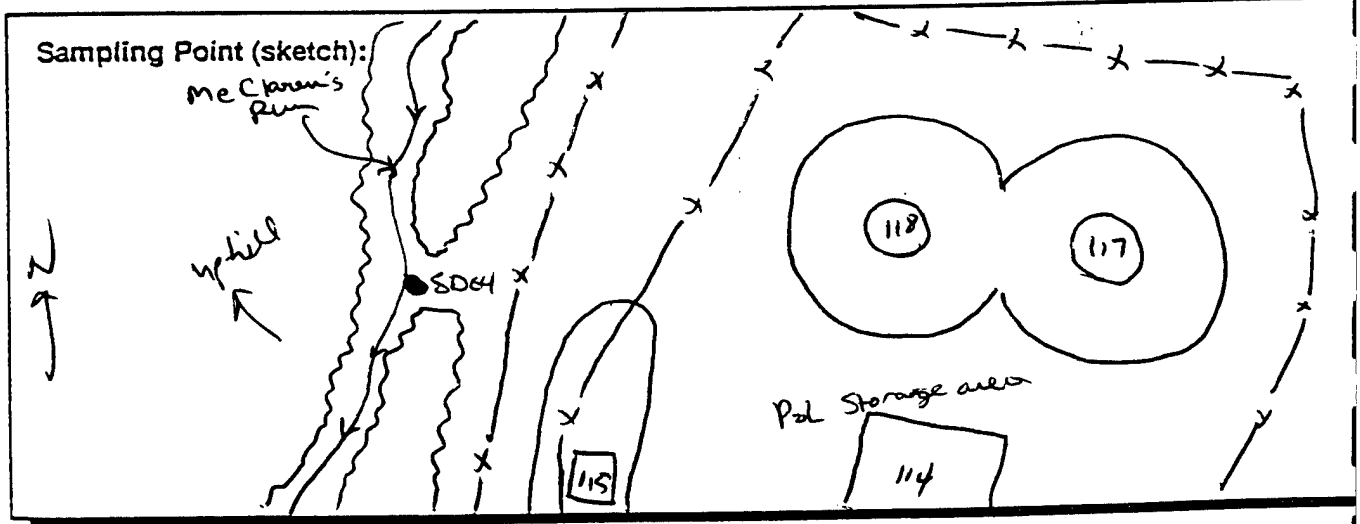
Project Name Pittsburgh Area 1H at PLW
Location Site 7 - PDL - McClaren's Run
Recorded By PATRICK LAY for WAPORS Kirby
Date 11/17/94 - Sample Collection
Site 7 - PDL

Project Number 948902
Sample Number P-S7 - SD04
Duplicate Number —
Checked By
Date

Sampling Equipment Stainless Steel PL Auger
Sample Type Soil (Sediment) Rock

Sample Type Description
USCS Soil Type CL Clay
Color Brown
Odor Not recorded
Depth 0-0.5
Number of Samples 1
Comments Sample collected from creek bed.

Sampling Point (sketch):



Decontamination

Equipment: ☒ Hand auger
Type 2"
☐ Trowel
~~☒ Other Spoon~~ PL

Decontamination Fluids: Containerized for Subsequent Sampling
☐ Steam/Hot Water
☒ Detergent/water
☒ Potable Water
☒ Deionized Water
☒ Methanol
☐ Hexane
☐ HNO_3 ; dilution
☒ Other Air Dry

Figur

The Earth Technology Corporation

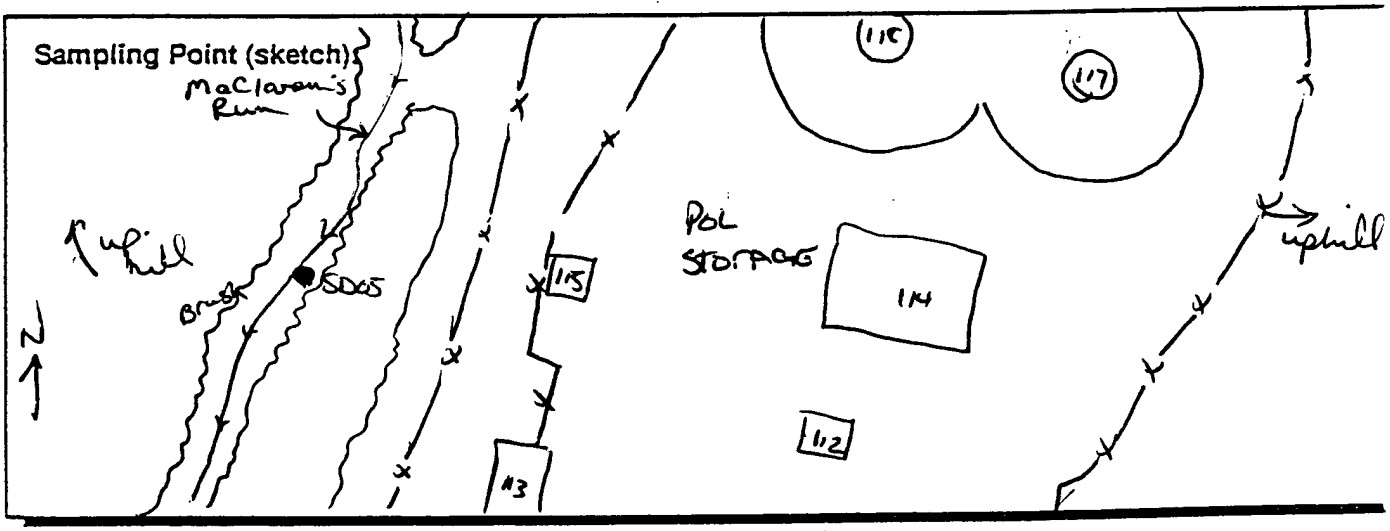
Soil/Sediment Sampling Record

Project Name Pittsburgh ANG 171ST ACW
Project Number 948982
Location Site 7 POL – McClarens Run
Sample Number P-S7-SD05
Recorded By Patrick Lay for Wade Kirby
Duplicate Number —
Date 11/17/95 – Collected
Checked By
Site 7 – POL –
Date

Sampling Equipment Stainless Steel Spoon Trowel
Sample Type Soil (Sediment) Rock

Sample Type Description
USCS Soil Type SM Sand w/ silt
Color Lt. Brown
Odor Not recorded
Depth 0-0.5
Number of Samples 1
Comments Sample collected from Creek Bed

Sampling Point (sketch):



Decontamination

Equipment: ☐ Hand auger
Type
☒ Trowel PHL
☒ Other Spoon

Decontamination Fluids: Containerized for Subsequent Sampling
☐ Steam/Hot Water
☒ Detergent/water
☒ Potable Water
☒ Deionized Water
☒ Methanol
☐ Hexane
☐ HNO_3 ; dilution
☒ Other Air Dry

Form F

Figure 3

The Earth Technology Corporation

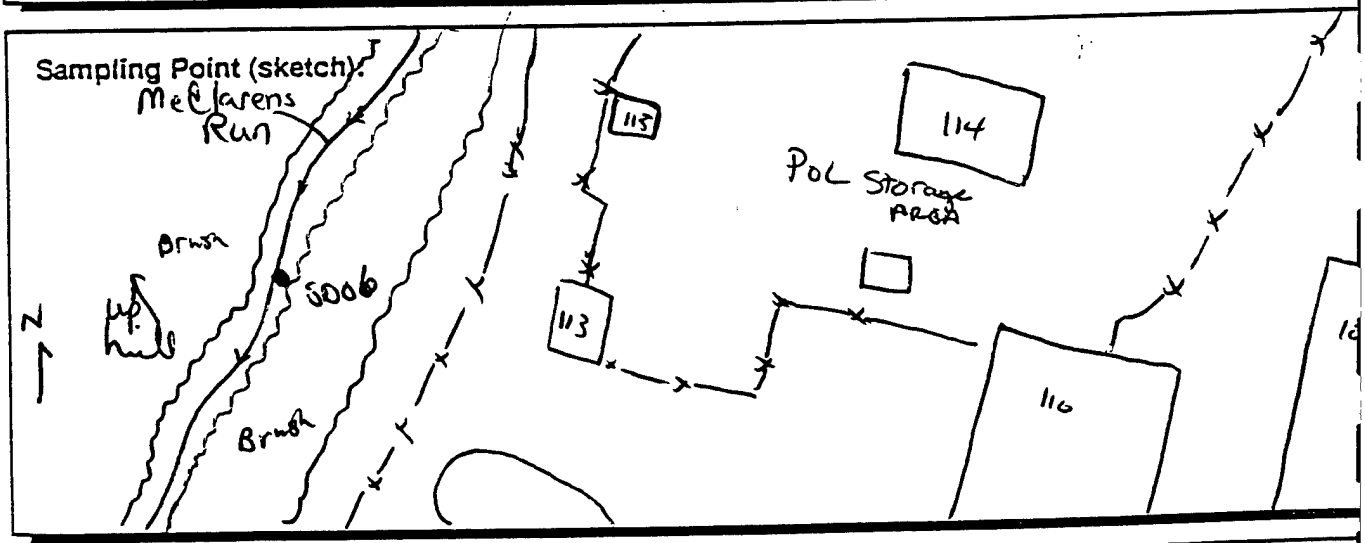
Soil/Sediment Sampling Record

Project Name Pittsburgh ANG 171ST ARW
Project Number 948902
Location Site 7 - POL McClarens Run
Sample Number P-S7-SD06
Recorded By PATRICK Lang for WADE Kirby
Duplicate Number
Date 11/17/94 Sample collected
Checked By
Site 7 - POL
Date

Sampling Equipment Stainless Steel PTFE Trowel
Sample Type Soil (Sediment) Rock

Sample Type Description
USCS Soil Type SP Sand m.
Color Brown, WET
Odor NOT Recorded
Depth 0-0.5'
Number of Samples 1
Comments Collected from Creek Bed

Sampling Point (sketch):



Decontamination
Equipment: ☐ Hand auger
Type
☐ Trowel
☑ Other Steel PL Trowel

Decontamination Fluids: Containerized for subsequent sampling
☐ Steam/Hot Water
☑ Detergent/water
☑ Potable Water
☑ Deionized Water
☑ Methanol
☐ Hexane
☐ HNO_3 ; dilution
☑ Other Air Dry

Figur

EQUIPMENT CALIBRATION DAILY LOG: HNU

Pittsburgh International Airport - Penn ANG

Date: 11/10/94			
HNu Model: PI-101-17		Serial Number:	
Calibration Gas: Isobutylene 100ppm			
TIME:	600 (AM)	_____ (MIDDAY)	~~530~~ 520 WK (PM)
SPAN:	4.46		4.28
BACKGROUND PPM:	0		0
OPERATOR'S SIGNATURE:	D. Wade Kirk		D. Wade Kirk
COMMENTS:			

Date: 11/11/94			
HNu Model: PI-101-17		Serial Number:	
Calibration Gas: Isobutylene 100ppm			
TIME:	600 (AM)	_____ (MIDDAY)	1746 (PM)
SPAN:	4.34		4.32
BACKGROUND PPM:	0		0
OPERATOR'S SIGNATURE:	D. Wade Kirk		D. Wade Kirk
COMMENTS:			

Date: 11/12/94			
HNu Model: PI-101-17		Serial Number:	
Calibration Gas: Isobutylene 100ppm			
TIME:	640 (AM)	_____ (MIDDAY)	1610 (PM)
SPAN:	4.30		4.30
BACKGROUND PPM:	0		0
OPERATOR'S SIGNATURE:	D. Wade Kirk		D. Wade Kirk
COMMENTS:			

EQUIPMENT CALIBRATION DAILY LOG: HNU

Pittsburgh International Airport - Penn ANG

Date: 11/14/94			
HNu Model: PI-101-17		Serial Number:	
Calibration Gas: Isobutylene 100 ppm			
TIME:	545 (AM)	_____ (MIDDAY)	_____ (PM)
SPAN:	4.16		
BACKGROUND PPM:	0		
OPERATOR'S SIGNATURE:	D. Wade Kaj		
COMMENTS: HNu turned off in field - not calibrated in morning			

Date: 11/15/94			
HNu Model: PI-101-17		Serial Number:	
Calibration Gas: Isobutylene 100 ppm			
TIME:	550 (AM)	_____ (MIDDAY)	2100 (PM)
SPAN:	3.32		3.32
BACKGROUND PPM:	0		0
OPERATOR'S SIGNATURE:	D. Wade Kaj		D. Wade Kaj
COMMENTS: HNu needle drifting during morning & evening calibration			

Date: 11/16/94			
HNu Model: PI-101-17		Serial Number:	
Calibration Gas: Isobutylene - 100 ppm			
TIME:	530 (AM)	_____ (MIDDAY)	_____ (PM)
SPAN:	3.62		
BACKGROUND PPM:			
OPERATOR'S SIGNATURE:	D. Wade Kaj		
COMMENTS: needle drifting during morning calibration - would not zero out - moisture affected HNu, turned Ai in field, not calibrated in morning			

Appendix C: Geophysics Survey Procedure

EARTH TECH
14496 Sheldon Road
Suite 210
Plymouth, MI 48170
Ph: 313/416-5678 Fax: 313-416-5698

M E M O R A N D U M

Date: January 19, 1995

To: Carol Frye

CC: Project File

From: Hosam N. Hassanien

Subject: **Air National Guard Base, Pittsburgh, PA**
(ET/Ply. Proj. No. 83758.00)

Per your request, I have prepared a summary describing two non-destructive geophysical techniques used at the above referenced site to locate subsurface jet fuel pipes and utility lines. The area subjected to the geophysical survey is described as Site 7-POL Area. This area is composed of two areas, the POL storage area and the fuel dispensing pipeline. The following is a description of the two techniques used at the site.

1) Fisher TW-6 Metal Detector

The TW-6 metal detector is of the transmitter-receiver type. The TW-6 was operated in the Inductive Locating Mode to locate the jet fuel pipeline and cables. In this mode, the transmitter induces an electromagnetic field (main field) around the subsurface object under investigation. The object, in turn, produces a secondary electromagnetic field by induction. This secondary field can be recorded or sensed by the receiver in the detector. As the operator walks toward the buried object, the speaker sound and detector indication will increase. They will reach maximum readings when the operator is directly over the buried object or conductor. As the operator crosses over, the indications will begin to decrease because the operator is moving away from the buried conductor. The center of the buried object will correspond to the highest indication.

The above described method was very successful in locating the jet fuel pipeline and other subsurface conductors, such as power and communication cables and natural gas lines.

2) Ground Penetrating Radar (GPR)

The GPR used at the site is the GSSI SIR System 3 Radar which consists of 3205TR Transducer (transmitter/receiver), PR-8304 Profiling Recorder, CC-30/11 Control Cable and Model 10 Remote Marker.

The GPR functions very much like conventional radar; subsurface conductive objects reflect the transmitted electromagnetic signals, a receiver detects the reflected signals which are

recorded and stored by the instrument. The signals are recorded using a strip chart recording unit, and the result is a continuous graphical display of radar signals. The printed graphic records can be used in the field for rapid qualitative interpretation of subsurface conditions, including locations of buried objects.

A survey grid was established for the GPR survey over the areas of interest to allow proper referencing of the recorded data to actual site locations. The GPR data was then collected and recorded by walking the transducer at a relatively constant speed over the survey grid lines. All GPR records were labeled and the location of the grid lines were noted on the records.

The GPR was successfully used at the site to locate a wide variety of subsurface utility lines such as water mains, sanitary and storm sewer lines, and an underground storage tank.

I hope this information is adequate for your SI final report. If you desire additional information or if you have questions regarding this memo, please call me at 313/416-5678

Appendix D: Screening Data

On-Site Analytical Methods

Approximately 6 to 10 ml of soil gas or headspace was collected for each sample and promptly analyzed by the on-site mobile laboratory. Subsamples (replicates) from these samples were injected into the GC in volumes of 100 to 400 microliters. This section provides a general description of soil gas and soil sample analytical instrumentation and target compounds of concern.

Instrumentation and Target Compounds

All samples collected for on-site analysis during the Pennsylvania ANG Base survey were analyzed using a Shimadzu 14A laboratory-grade GC equipped with both an electrons capture detector (ECD) and flame ionization detector (FID). The analytical column was a 105 meter x 0.53 mm Restek R_tx-Volatiles megabore capillary column. The GC was controlled by a Shimadzu CR4-AX integration computer equipped with a 20 MB GC hard disk for method and data storage, and a thermal transfer printer for hard-copy output. The oven was temperature programmable, and helium was used as the carrier gas.

Three different concentrations of standards were analyzed for the initial calibration of the GC and ECD for analyses of 1,1-dichloroethene (DCE), 1,2-DCE, trichloroethene (TCE), and tetrachloroethene (PCE). These three-point calibrations were performed to ensure analyses for these analytes were within the linear range of the analytical equipment. Three-point calibrations were also performed to ensure analyses of BTEX and total volatile organic compounds (TVOC) analytes were within the linear range of the GC and FID. Subsequent calibrations of the GC and ECD were performed using concentrations of standards that were within 20 percent of the mid-concentration levels of the standards used for the three-point calibrations.

The standards for the three-point calibrations were made from Supelco Inc. traceable standards and reagent blanked solvents. The instrument calibrations were checked periodically throughout each day to monitor the response factor and retention time.

Gas Chromatograph Process

The soil gas vapor, or headspace, is injected into the GC and swept through the analytical column by the carrier gas. The detector senses the presence of a component different from the carrier gas and converts that information to an electrical signal. The components of the sample pass through the column at different rates, according to their individual properties, and are identified by the detector. Compounds are identified according to the time it takes them to pass through the column (retention time).

Electron Capture Detector Process

The ECD captures low energy thermal electrons that have been ionized by beta particles. The flow of these captured electrons into an electrode produces a small current, which is collected and measured. When the halogenated TVOCs are introduced into the detector, electrons that would otherwise be collected at the electrode are captured by the sample, resulting in decreased current. The current causes the computing integrator to record a peak on the chromatogram. The area of the peak is compared to the peak generated by a known standard to determine the concentration of the analyte.

Flame Ionization Detector Process

The FID utilizes a flame produced by the combustion of hydrogen and air. When a TVOC, which has been separated on the GC analytical column, is introduced into the flame, a large increase in ions occurs. A collector with a polarizing voltage is applied near the flame attracting ions which produce a current proportional to the amount of the sample compound in the flame. The electrical current causes the computing integrator to record a peak on a chromatogram. By measuring the area of the peak and comparing that area to the integrator response of a known aqueous standard, the concentration of the analyte in the sample is determined.

The detection limits for target compounds depend on the sensitivity of the detector to the individual compound as well as the volume of the injection. The detection limits of the target compounds were calculated from the response factor, the sample size, and the calculated minimum peak size (area) observed under the conditions of the analyses. If any compound was not detected in an analysis, the detection limit is given as a "less than" value, e.g., <5 or reportable detection limit.

PHASE I 681 70

PRELIMINARY SITE INVESTIGATION REPORT: SOIL-GAS, SOIL AND SHALLOW GROUNDWATER SURVEY PENNSYLVANIA AIR NATIONAL GUARD PITTSBURGH, PENNSYLVANIA

Prepared for:

The Earth Technology Corporation
1420 King Street, Suite 600
Alexandria, Virginia 22314

Prepared by:

EnviroSurv, Inc.
2800-C Dorr Avenue
Fairfax, Virginia 22031

December, 1994

REPORT CONTENTS

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I PROJECT SUMMARY

The report findings presented herein, represent partial actions taken to identify problems with potentially contaminated sites at the Pittsburgh, Pennsylvania Air National Guard Base (ANGB). Prior to soil-gas, soil and shallow groundwater sampling and analysis, Earth Tech performed a preliminary assessment of Site 1 at the subject Air National Guard facility; the POL Facility and Fuel Distribution Lines. This effort included a surface reconnaissance and historical records/data survey (e.g., a previous limited soil-gas survey was performed in 1991) for evidence of possible contamination. Information from this records review and site reconnaissance were used to design the more detailed soil-gas, soil and shallow groundwater survey described herein.

This preliminary site investigation of the POL and associated JP-4 distribution lines was a broad based screening effort to determine the general presence of target volatile organic compounds. The survey consisted of the following tasks:

- Development of a Field Sampling Plan (Earth Tech) (See **Figures 1&2**)
- Field Sampling of soil-gas, soil and shallow groundwater for target VOCs (EnviroSurv, Inc.)
- Mobile laboratory analysis of soil-gas, soil and shallow groundwater (EnviroSurv, Inc.)
- Fixed laboratory analysis and validation of a percentage of the soil samples screened in the field (Earth Tech and their fixed-based laboratory subcontractor)
- Validation, reduction and interpretation of mobile laboratory data (EnviroSurv, Inc.)
- Preparation of a Site Investigation Report (Earth Tech and EnviroSurv, Inc.)

EnviroSurv, Inc. provided the following services in support of TETC's Preliminary Site Investigations at the Pittsburgh, Pennsylvania ANGB:

- Rock coring of surface pavement (e.g., runways) for sample access

- Collection of 57 soil-gas samples and on-site analysis for BTEX and target chlorinated compounds

- Collection of 15 groundwater screening samples and on-site analysis for BTEX and target chlorinated compounds.

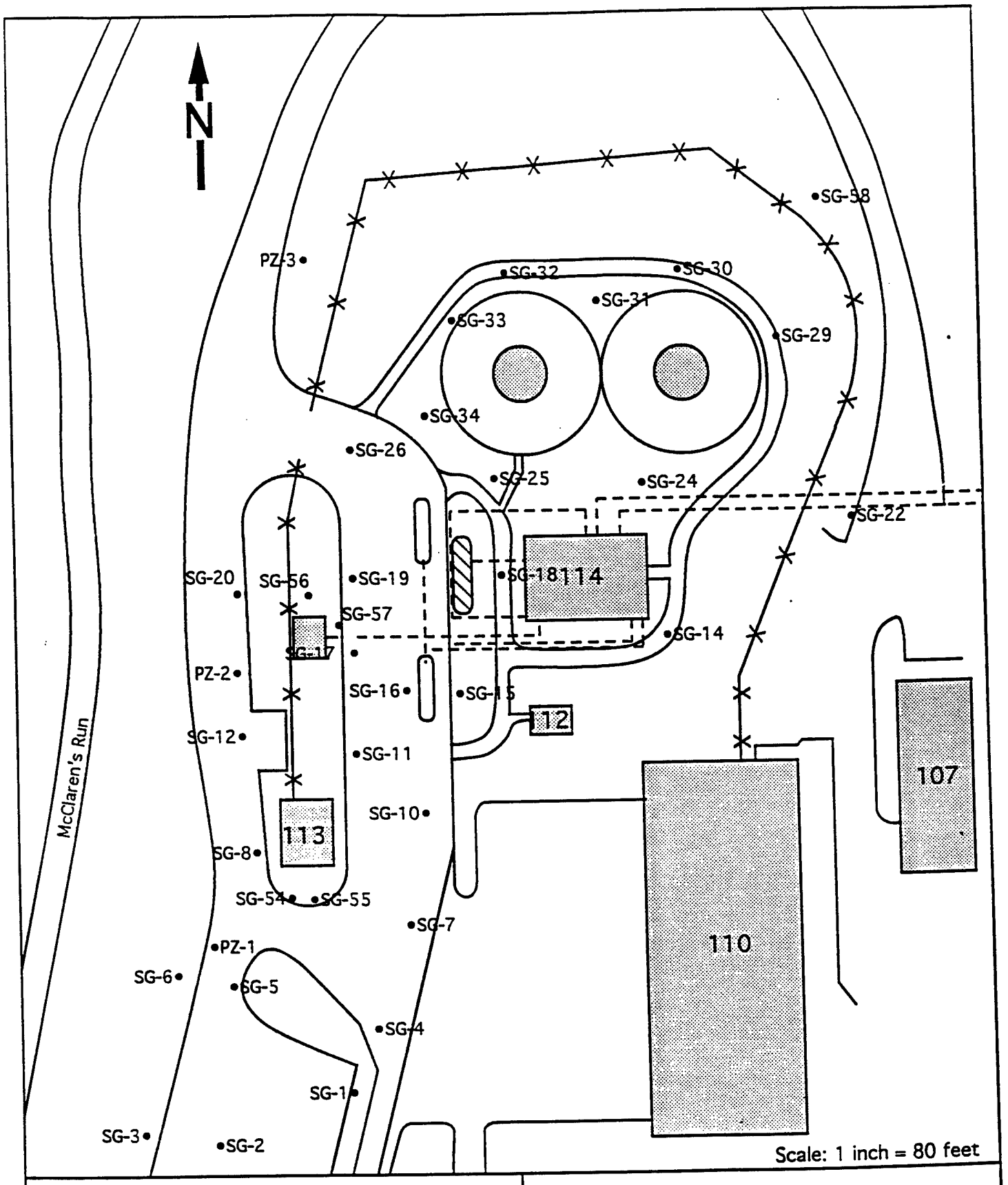
- Installation of six temporary piezometers for measurement of shallow groundwater depths

- Collection of 28 soil samples and select sample analysis for BTEX and target chlorinated compounds; collection of splits for off-site fixed lab analysis

- Collection and analysis of approximately 10% QA/QC samples, including instrument and syringe blanks, and field and laboratory duplicates.

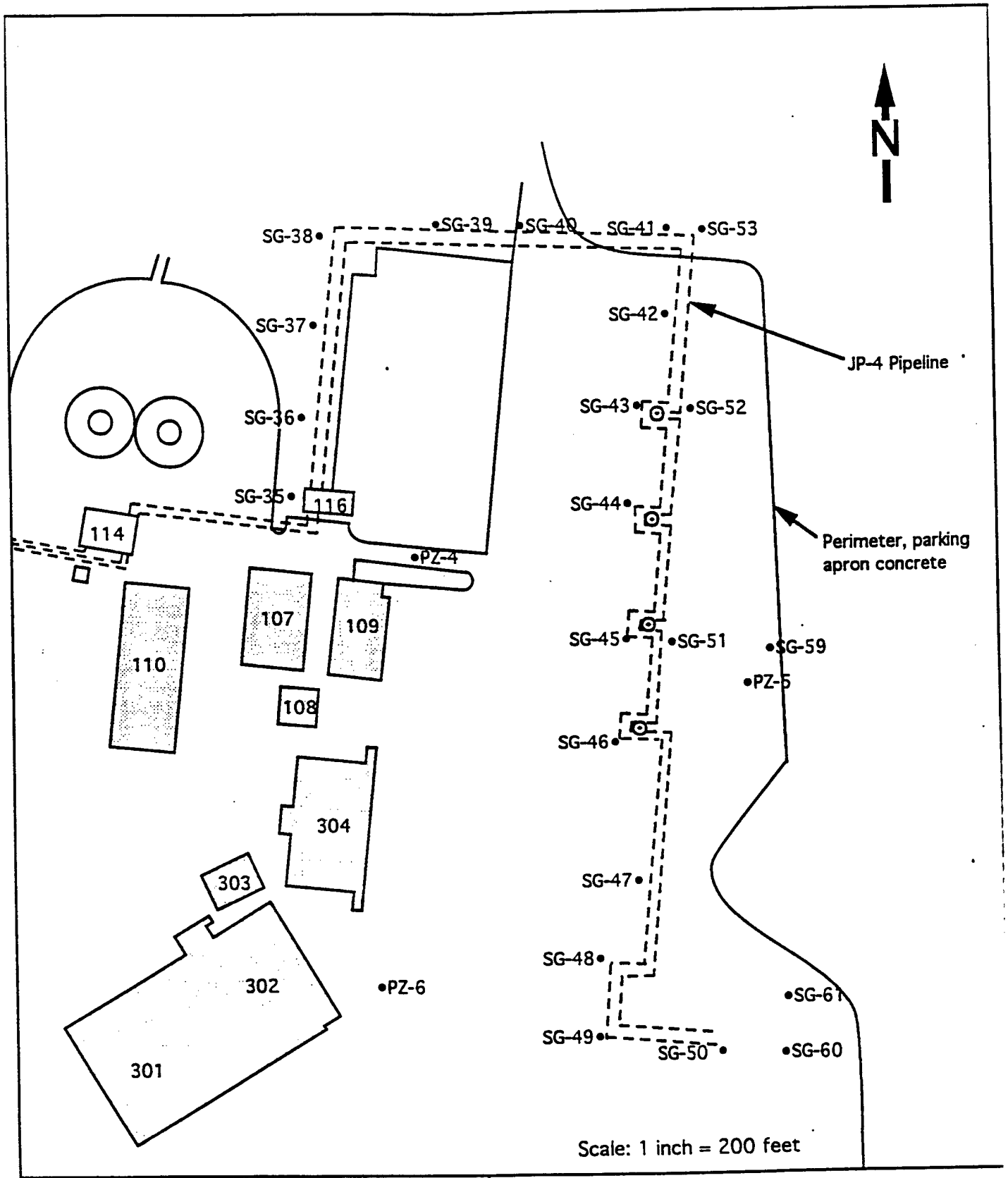
- Development and submittal of draft data tables and sample location maps for the eight survey sites.

- Development and submittal of this Project Report which includes documentation of all field sampling and mobile laboratory procedures, and a general interpretation of data.



Prepared By: **ENVIROSURV, INC.**
2800-C Dorr Ave.
Fairfax, VA 22031

Figure 1. Pennsylvania ANG POL Storage Area Site and Sampling Locations



Prepared By; **ENVIROSURV, INC.**
2800-C Dorr Ave.
Fairfax, VA 22031

Figure 2. Fuel Hydrant Pipeline Site and Sampling Locations

Major Findings

• Notable contamination by Total JP-4 Volatiles, as indicated by soil-gas data, was found at various locations throughout the POL storage area and sporadically along the fuel distribution pipeline. Tight, low permeability silts, clays and shale were routinely encountered throughout the survey area. Soil-gas data therefore, may represent limited "point source" results, with minimal radii of influence. Nevertheless, "hot spot" areas were identified for possible characterization during subsequent soil-boring and monitoring well installation phases of the site investigation, if these additional sub-surface characterization activities are deemed necessary.

• "Significant" Total JP-4 volatile results were also obtained for soil and shallow groundwater. Water "hits" in the POL storage area was found primarily southwest of the large aboveground tanks and west of Building #114.. Maximum soil "hits" were found primarily northeast of the tanks along the containment berm.

• Low (<2 ppm) to trace levels of target chlorinated solvents (t-1,2-DCE and 1,2-DCA) were detected in only three of the total fifty-seven soil-gas samples. All three "hits" were in a linear trend (SG-12, SG-16 and SG-18) southwest of Building #114. No target chlorinated analytes were detected in any of the soil or shallow groundwater samples analyzed.

II PROJECT OBJECTIVES

Soil-gas sampling techniques are of two varieties: Passive and Active. Passive surveys which utilize a static trapping device implanted in the ground have the limitation that a long period of time is required for sample collection and analysis. Active surveys, on the other hand, provide results in near real-time and sampling plans can be modified as results become available from the on-site mobile laboratory. The "active" approach was employed during this investigation providing immediate field results for the detection of potentially "significant" target compound contamination. Based on soil-gas results, soil and shallow groundwater sample locations were selected for further characterization.

The following target VOC compounds (and respective detection limits) were analyzed in all soil-gas, shallow groundwater and soil samples

	Quantitation Limits		
	Soil-gas (ppm)	Water (ppb)	Soil (ppb)
• Benzene	0.50	2.0	2.0
• Toluene	0.50	2.0	2.0
• Ethylbenzene	0.50	2.0	2.0
• Total Xylenes	1.0	2.0	5.0
• Total JP-4 Volatiles	20.0	5.0	50.0
• trans-1,2-DCE	0.1	2.0	2.0
• cis-1,2-DCE	0.1	2.0	2.0
• 1,2-DCA	0.1	2.0	2.0
• TCE	0.01	0.2	0.2
• PCE	0.01	0.2	0.2

III FIELD SAMPLING AND MOBILE LABORATORY PROCEDURES

Sampling Survey Design

Earth Tech surface reconnaissance of the POL and associated JP-4 distribution lines helped in the soil-gas, soil and shallow groundwater sampling survey design. In general, soil-gas sample locations followed a pre-determined grid. A lesser number of locations, however, were chosen according to specific site features as directed by Earth Tech's on-site representative.

Field Activities

EnviroSurv, Inc.'s two-man probe sampling and mobile laboratory analysis team documented all field activities on both Field Sample Log Sheets and in Field Laboratory Notebooks. Information pertinent to sample collection (e.g., depth, volume, etc.) and analysis (e.g., QA /QC, target compounds identified, etc.) were recorded.

Field Sampling Procedures and QA/QC Protocols

Probe Placement: Sampling probes are constructed of 1/2-inch I.D. hardened steel in 3-foot lengths. The probe rods were driven into the soil by a hydraulic cylinder/percussion hammer unit mounted in the back of a 4-wheel-drive pickup truck. Probes were removed using the same hydraulic system. Asphalt and/or concrete penetration was required at many of the sample locations. A compressor-activated rock drill was used to auger a 1.5 inch pilot hole through up to 18-inches of pavement. The 3/4-inch outside diameter probe rod was then placed in the pilot hole and driven to depth.

Sample Collection: All information pertinent to the collection of field samples can be found on the Field Log Sheets in **Appendix A**.

Soil-Gas Sample Collection: Once the soil-gas probe was driven to the desired sampling depth (3 to 18' bgs), "post run" polypropylene tubing was attached to the lead rod via a threaded sample cap with o-ring (to prevent vacuum leakage). The dedicated sample line was then attached to the vacuum volume system located in the probe truck. A minimum of three tubing/sample container volumes (e.g., 2 liters) were purged before a sample was collected in a glass gas-sample bulb with Teflon stopcocks. Once filled, the glass gas-sample bulbs were delivered immediately to the on-site laboratory for analysis. The estimated time from sample extraction to gas chromatograph injection was usually less than one to two hours. Collection of soil gas in glass bulbs permitted sample dilutions and laboratory duplicate analyses to be run from the same sample location, as required.

Soil Sample Collection: Once the 1.5-inch wide by 2-foot long piston soil sampler (with either acetate or stainless steel liner) was driven to the top of the desired sampling depth, the piston was released via an extension rod inserted down the probe rod. With the core barrel free to move, the probe rod was driven an additional 2-feet to collect approximately 300-400 grams of soil. Soil samples for on-site analysis were containerized in 40 ml VOA vials cleaned to EPA specifications. Once collected, the samples were immediately delivered to EnviroSurv, Inc.'s mobile laboratory. Split soil samples for off-site analysis were sealed in stainless steel liners using end caps and teflon tape.

Groundwater Sample Collection: A pilot hole to the desired sample depth was driven using a 1-inch O.D. probe rod. Rods were subsequently removed and 1/2-inch I.D. PVC screen was temporarily installed. Once the slotted screen was in place, "dedicated"

polypropylene tubing, fitted with a small diameter foot-valve pump, was inserted down the "well point". Water samples were then containerized in 40 ml vials cleaned to EPA specifications. Once collected, water samples were immediately delivered to EnviroSurv, Inc.'s on-site mobile laboratory for analysis.

Field Duplicates: Two glass gas-sample bulbs or 40 ml VOA vials were filled at approximately 10% of the sampling points and treated as field duplicates to check the precision of sample collection procedures.

Equipment Decontamination: Dedicated polypropylene sampling line was used at each individual soil-gas and/or groundwater sample location. Once used, the tubing was discarded. All non-expendable equipment which came in contact with extracted soil-vapor, soil or shallow groundwater samples was thoroughly cleaned before re-use. Decontamination procedures included an initial scrub and wash using wire brushes and alconox detergent. After washing, equipment was rinsed with methanol and deionized water and allowed to air dry.

Field Laboratory Procedures and QA/QC Protocols

Instrumentation: All samples collected during the Pittsburgh, Pennsylvania ANGB Survey were analyzed on a Shimadzu 14A laboratory-grade GC equipped with both Flame Ionization and Electron Capture Detectors (FID/ECD). The analytical column used was a 105 meter x 0.53 mm Restek R_tx-volatiles megabore capillary column. The GC was controlled by a Shimadzu CR4-AX integrating computer equipped with a 20 MB hard disk for method and data storage, and a thermal transfer printer for hard-copy output.

Sample Quantitation: The FID/ECD results for target aromatic and chlorinated volatiles were determined by calculating the areas of individual chromatogram peaks. Peaks resulting from injection disturbances (e.g., air peak) were carefully separated from the individual early eluting volatile peaks. The reported results for BTEX and chlorinated hydrocarbons in soil gas, soil and water were quantitated using the response factors obtained from certified commercial standards. The total JP-4 volatiles result was obtained by sample comparison with JP-4 standards prepared on-site from pure product.

Instrument Calibration: The gas chromatograph was initially calibrated for soil-gas, soil and water using a certified BTEX gas standard and/or field-prepared vapor or aqueous standards for the ten target compounds of interest (See **Figures 3 and 4**. - Example Standard Chromatograms). All standards preparation was documented in the field laboratory log book and is traceable back to certified commercial standards. Retention times of standards were used to identify the chromatogram peaks and response factors were used to calculate concentrations for target compounds of interest.

Laboratory Blanks: A method blank was run at the beginning of each day to check for potential contaminants in the analytical system. The blank was taken by withdrawing a headspace sample from an empty glass soil-gas bulb or 40 ml VOA vial containing deionized water. The sample was injected into the gas chromatograph in the same way as the samples.

Laboratory Duplicates: Approximately 10% laboratory duplicate samples were injected to check the analytical precision of the method.

Sample Preparation: Soil-gas samples were received in the laboratory in 125 or 250 ml

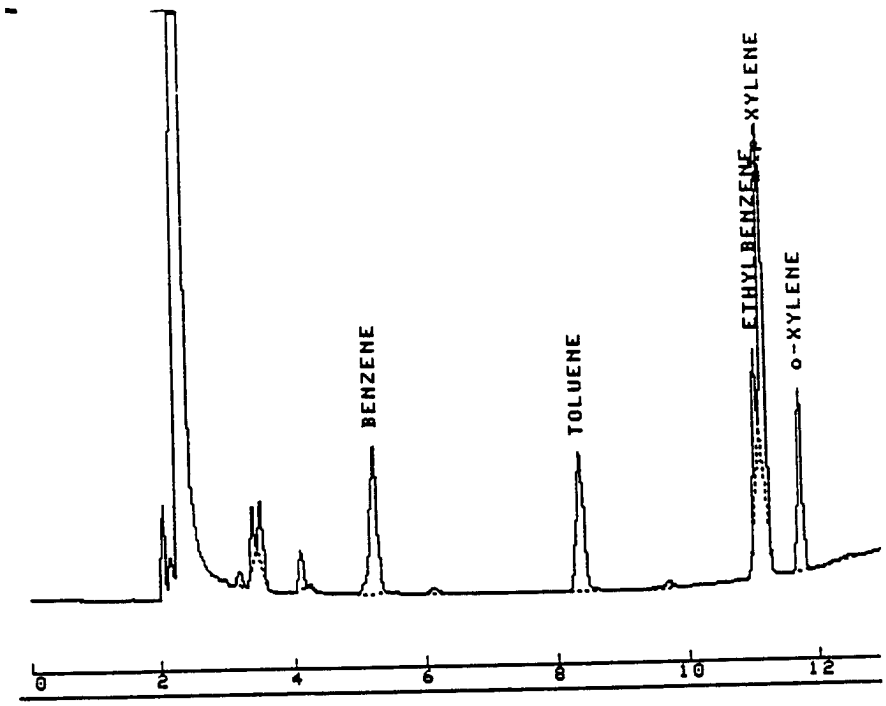


Figure 3. Example BTEX Standard Chromatogram

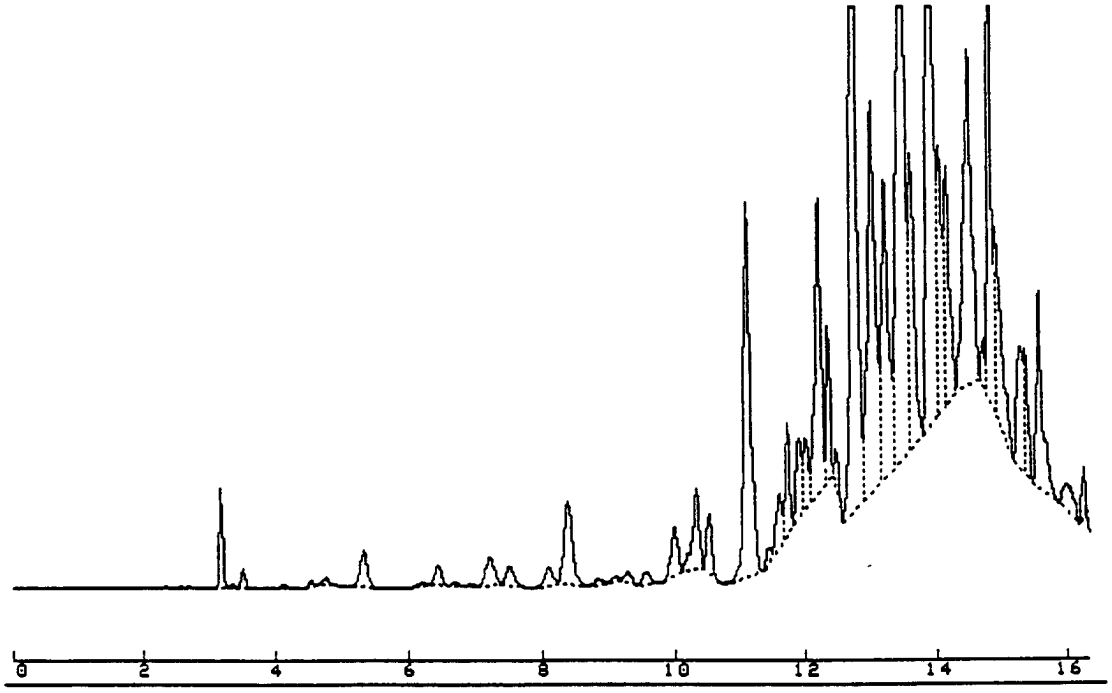


Figure 4. Example JP-4 (Total Volatiles) Standard Chromatogram

glass gas sampling bulbs. A sample was withdrawn through the septum using a syringe and injected directly into the GC. Water samples were received in the mobile lab in completely filled 40 ml VOA vials. Ten mls were subsequently decanted, and the samples were heated for 90 minutes at 90 degrees C before a headspace sample was taken using a gas-tight syringe. Water headspace was injected directly into the GC. Soil samples were received in the mobile lab in pre-weighed VOA vials. Approximately 20 to 30 grams were also heated in an oven for 90 minutes at 90 degrees C. Soil headspace was subsequently injected directly into the GC.

IV GENERAL INTERPRETATION OF FIELD SAMPLING AND MOBILE LABORATORY ANALYTICAL RESULTS

Sampling locations and corresponding soil-gas and shallow groundwater results for Site 1, the POL Facility and Fuel Distribution Lines, are included in **Figures 5 through 8**. **Tables 1,2 and 3** contain all soil-gas, shallow groundwater and soil screening data, including QA/QC results.

POL Facility (Figures 5&6) - Petroleum hydrocarbons were detected in soil-gas at moderate concentrations of up to 270 ppm Total JP-4 Volatiles. No single source area of petroleum contamination was readily identifiable. "Hits" were distributed sporadically throughout the Storage Area in "bulls-eye" anomalies; evidence perhaps of numerous isolated "spills."

Low levels (< 2.0 ppm) of t-1,2-DCE and 1,2-DCA were detected in three soil-gas samples southwest of Building #114. These were the only chlorinated "hits" in soil-gas, soil and water throughout the entire survey area.

"Significant" groundwater results (up to 23,000 ppb Total JP-4 volatiles) were detected in two locations within the Storage Area - south of the tanks at SG-25, and west of Building #114 at SG-19 and SG-57. Despite the presence of "low permeability" silt and clay-rich soils in the vadose zone, shallow groundwater appears to have been impacted. Based on probing conditions, however, water does not appear to be uniformly distributed throughout the survey area. It was encountered sporadically in perched layers and potentially above fracture zones in shallow bedrock.

Fuel Distribution Lines (Figures 7&8) - Petroleum hydrocarbons were detected in soil-gas at "significant" concentrations of up to 20,000 ppm Total JP-4 Volatiles along the distribution pipeline. The distribution of "hits" seemed to correspond to some extent with the fuel hydrants, suggesting the occurrence of historical spills around the re-fueling pits.

No target chlorinated compounds were detected in any of the soil-gas, soil or shallow groundwater samples collected at the Fuel Hydrant Pipeline site..

"Significant" groundwater results (up to 10,000 ppb Total JP-4 volatiles) were detected at several locations along the distribution pipeline; namely in the vicinity of the fuel hydrant adjacent sample location SG-52 and east of the pipeline terminus around sample location SG-60. Similar to the Storage Site directly to the east, shallow groundwater was encountered sporadically in perched layers of fill and native saprolitic soils, and potentially above fracture zones in shallow bedrock.

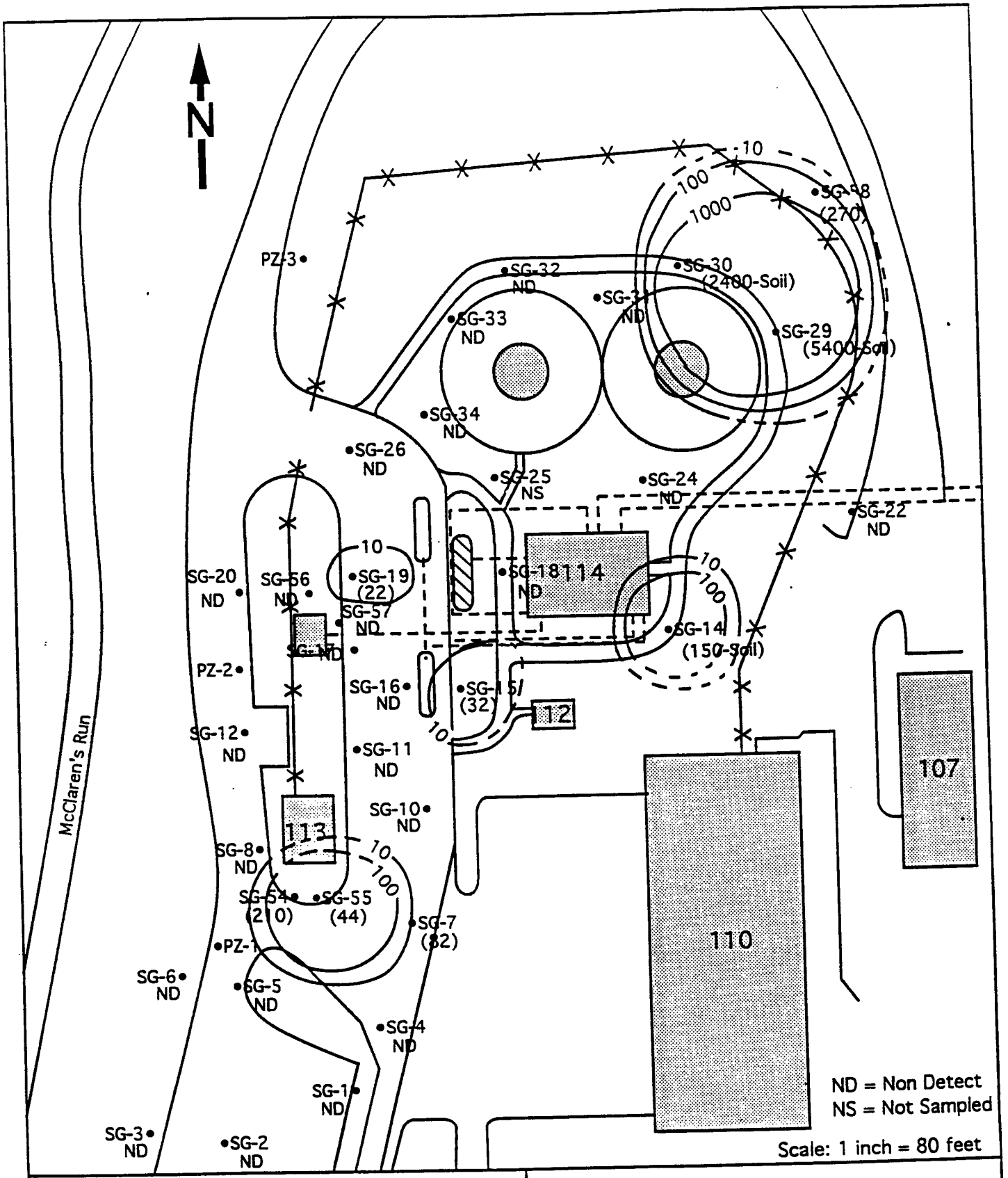


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Figure 5. POL Storage Area Site - Soil & Soil-Gas Results, Total Volatiles (µg/l; µg/Kg)

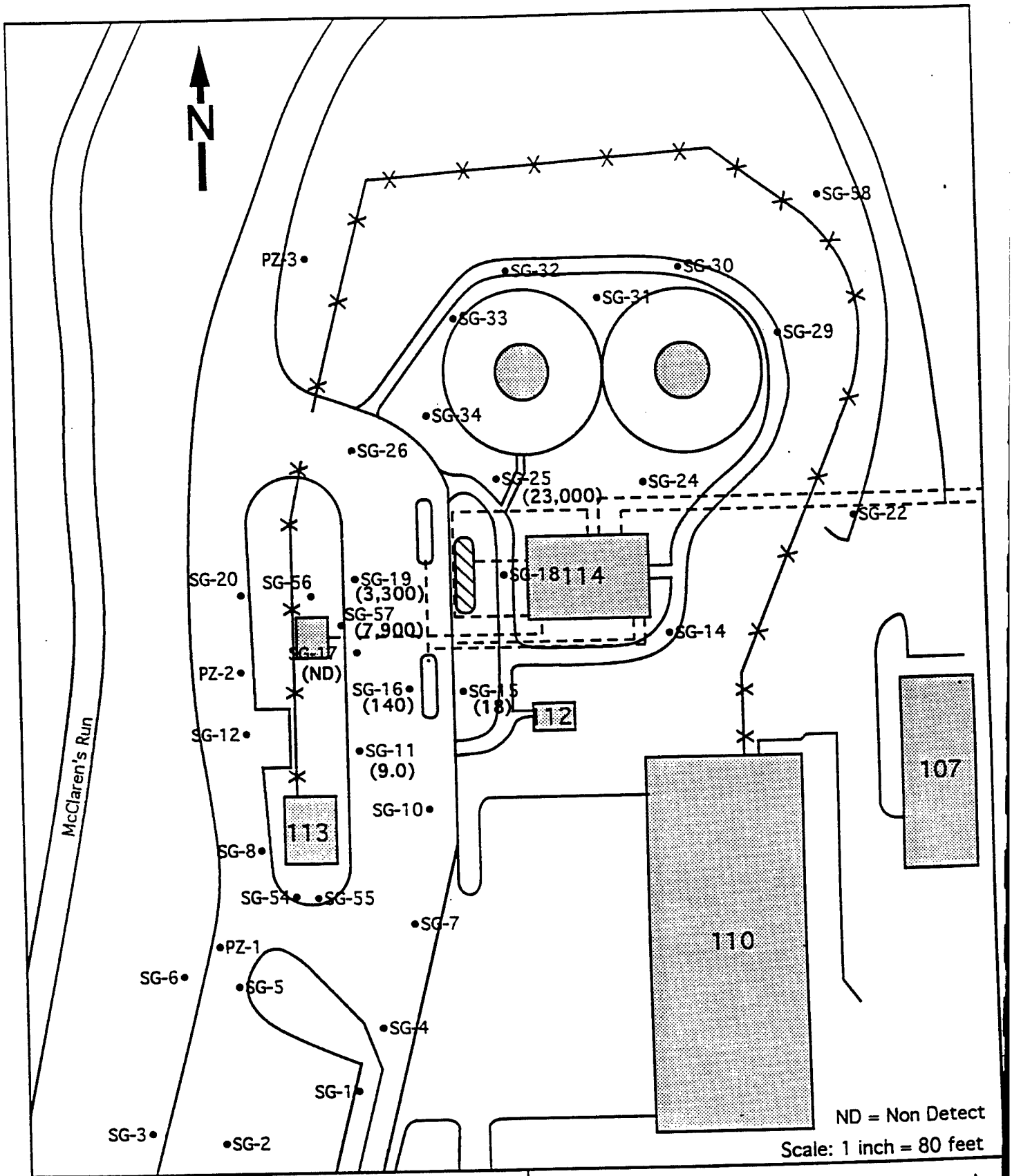

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Figure 6. POL Storage Area Site - Groundwater Results, Total Volatiles (μg/L)

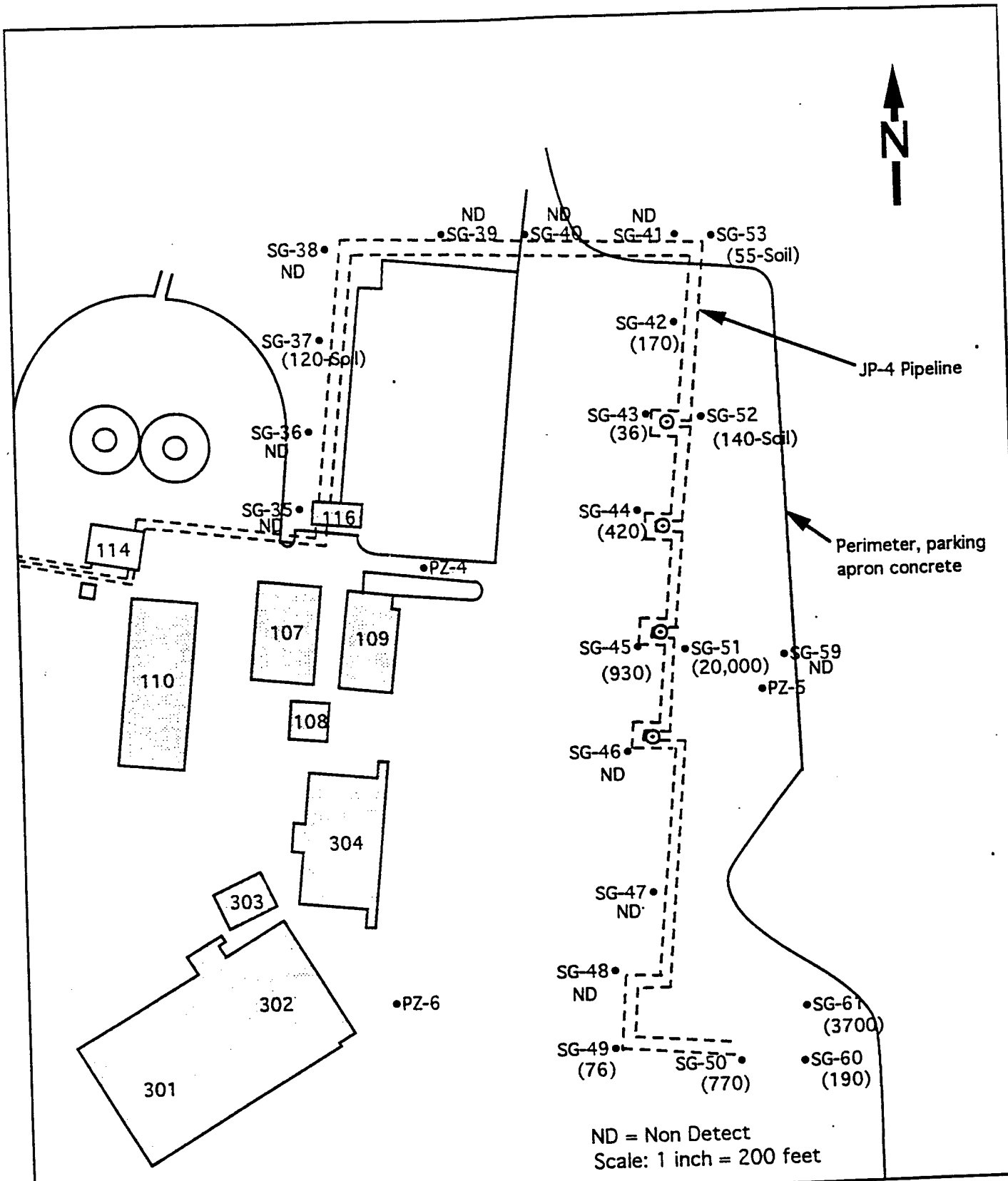

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Figure 7. Fuel Hydrant Pipeline Site - Soil & Soil-Gas Results, Total Volatiles (µg/L; µg/Kg)

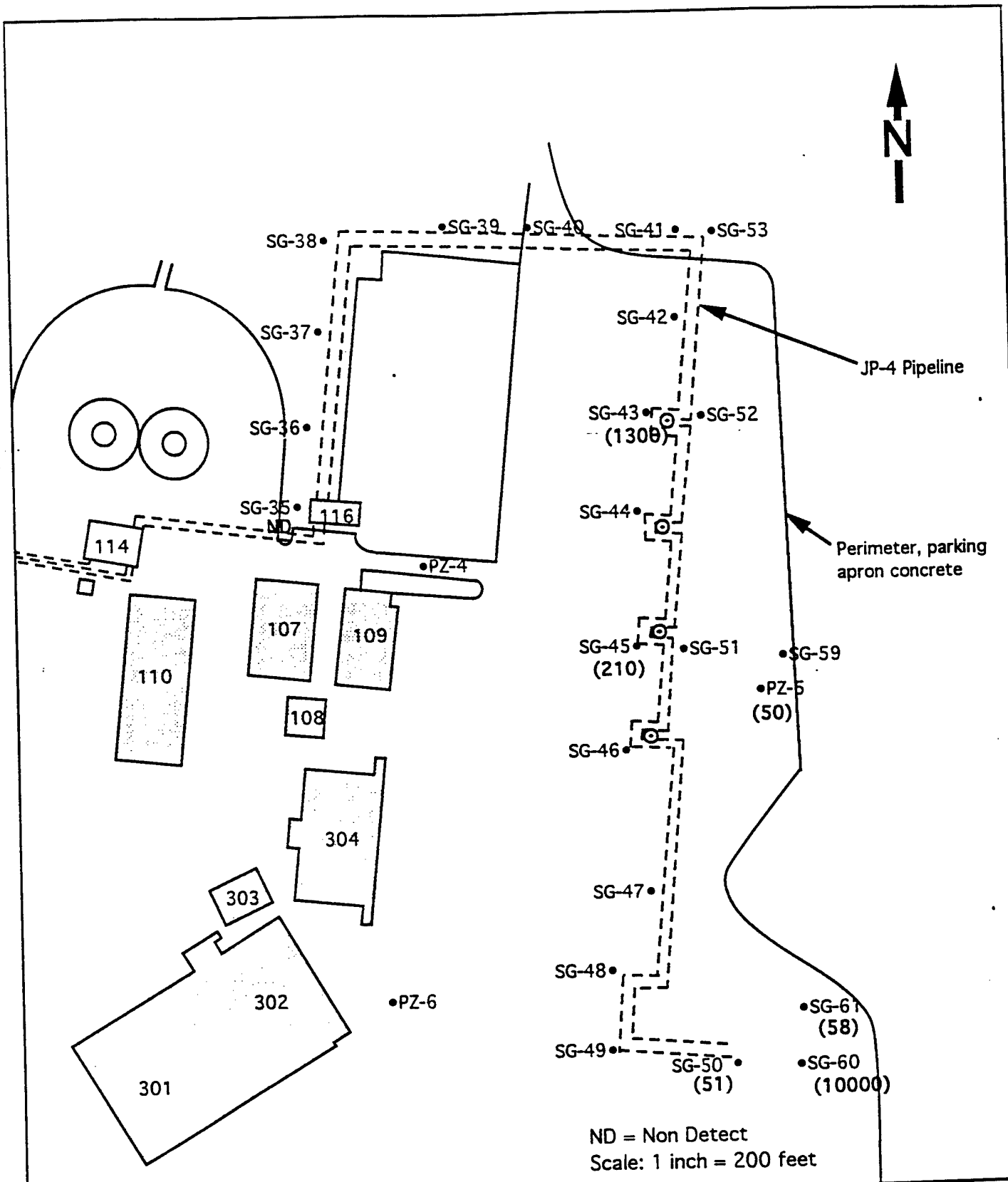

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Figure 8. Fuel Hydrant Pipeline Site - Groundwater Results, Total Volatiles (μg/L)

TABLE 1. SOIL-GAS RESULTS

Soil gas values are expressed as ppm.

Sample ID	Depth , ft.	t-1,2-DCE	c-1,2-DCE	1,2-DCA	TCE	PCE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Volatiles, as JP-4
Soil Gas											
P-S7-SG-1	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-1 L	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-2	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-3	15	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-4	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-5	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-5 F	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-6	18	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-7	12	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	1.4	82
P-S7-SG-8	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-10	8.5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-11	9	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-12	5	<0.1	<0.1	2.0	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-12	10	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-12	15	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-15	9	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	32
P-S7-SG-16	5	<0.1	<0.1	0.91	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-16 L	5	<0.1	<0.1	0.98	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-17	10	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-18	5	0.32	<0.1	0.61	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-18 L	5	0.42	<0.1	0.75	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-18	10	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	22
P-S7-SG-19	9	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-19 F	9	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-20	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-20	10	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-22	9	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-22 F	9	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-24	6	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-26	9	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20

TABLE 1. SOIL-GAS RESULTS

Soil gas values are expressed as ppm.

Sample ID	Depth , ft.	t-1,2-DCE	c-1,2-DCE	1,2-DCA	TCE	PCE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Volatiles, as JP-4
Soil Gas											
P-S7-SG-31	6	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-32	7.5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-33	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-34	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-35	8.5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-36	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-36 F	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-38	7	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-38 F	7	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-39	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-40	3	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-41	10	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	170
P-S7-SG-42	8	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-43	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	22
P-S7-SG-43	10	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	1.4	36
P-S7-SG-43	13	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	1.4	36
P-S7-SG-43 L	13	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	420
P-S7-SG-44	5.5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	310	930
P-S7-SG-45	5.5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-46	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-46 L	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-47	12	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-48	7.5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	76
P-S7-SG-49	7	<0.1	<0.1	<0.1	<0.01	<0.01	3.3	<0.50	<0.50	8.8	770
P-S7-SG-50	9	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	13	65	<1.0	20000
P-S7-SG-51	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	8.7	1700
P-S7-SG-51	9.5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-53	6	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-53 L	6	<0.1	<0.1	<0.1	<0.01	<0.01	3.2	3.9	4.0	<1.0	210
P-S7-SG-54	12	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	44
P-S7-SG-55	12	<0.1	<0.1	<0.1	<0.01	<0.01					

TABLE 1. SOIL-GAS RESULTS

Soil gas values are expressed as ppm.

Sample ID	Depth , ft.	t-1,2-DCE	c-1,2-DCE	1,2-DCA	TCE	PCE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Volatiles, as JP-4
Soil Gas											
P-S7-SG-56	10	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	2.3	34
P-S7-SG-57	9	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-58	4	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	270
P-S7-SG-59	6	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-59 F	6	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20
P-S7-SG-60	5	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	5.4	<0.50	29	190
P-S7-SG-61	9	<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	15	3700
Equipment Blk		<0.1	<0.1	<0.1	<0.01	<0.01	<0.50	<0.50	<0.50	<1.0	<20

TABLE 2. SHALLOW GROUNDWATER RESULTS.

Water values are expressed as ppb.

Sample ID	Depth , ft.	t-1,2-DCE	c-1,2-DCE	1,2-DCA	TCE	PCE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Volatiles, as JP-4
P-S7-SG11-W	5	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<2.0	9.0
P-S7-SG15-W	8	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	2.9	<2.0	8.2	18
P-S7-SG15-W F	8	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	2.5	<2.0	8.0	17
P-S7-SG16-W	2	<2.0	<2.0	<2.0	<0 .2	<0.2	6.6	5.9	<2.0	10	140
P-S7-SG17-W	9	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<2.0	<5.0
P-S7-SG19-W	8	<2.0	<2.0	<2.0	<0 .2	<0.2	700	370	<2.0	1300	3300
P-S7-SG25-W	4	<20	<20	<20	<2.0	<2.0	340	600	<2.0	7000	23000
P-S7-SG35-W	5	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<2.0	<5.0
P-S7-SG43-W	11	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	120	1300
P-S7-SG45-W	3.8	<2.0	<2.0	<2.0	<0 .2	<0.2	9.4	26	<2.0	56	210
P-S7-SG50A-W	4.8	<2.0	<2.0	<2.0	<0 .2	<0.2	2.5	<2.0	<2.0	<2.0	36
P-S7-SG50A-W L	4.8	<2.0	<2.0	<2.0	<0 .2	<0.2	2.6	<2.0	<2.0	<2.0	51
P-S7-SG50B-W	3	<2.0	<2.0	<2.0	<0 .2	<0.2	4.3	2.9	<2.0	<2.0	35
P-S7-SG57-W	4	<2.0	<2.0	<2.0	<0 .2	<0.2	3700	2800	7500	13000	7900
P-S7-SG60-W	5	<20	<20	<20	<2.0	<2.0	1100	1300	<20	4600	10000
P-S7-SG61-W	5	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<2.0	58
P-S7-PZ5-W	3	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	9.1	50
Equipment Blk		<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<2.0	<5.0

TABLE 3. SOIL RESULTS

Soil values are expressed as ppb.

Sample ID	Depth , ft.	t-1,2-DCE	c-1,2-DCE	1,2-DCA	TCE	PCE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Volatiles, as JP-4
P-S7-SG12-S	8-9	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<5.0	<50
P-S7-SG14-S	0.5 -1.5	<2.0	<2.0	<2.0	<0 .2	<0.2	4.5	11	<2.0	34	150
P-S7-SG14-S F	0.5 -1.5	<2.0	<2.0	<2.0	<0 .2	<0.2	2.9	7.3	<2.0	22	120
P-S7-SG20-S	8-9	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<5.0	<50
P-S7-SG29-S	0.5 -1.5	<2.0	<2.0	<2.0	<0 .2	<0.2	370	330	<2.0	640	5400
P-S7-SG30-S	0.5 -1.5	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	120	<2.0	270	2400
P-S7-SG37-S	5-7	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<5.0	120
P-S7-SG52-S	5-7	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<5.0	91
P-S7-SG52-S L	5-7	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<5.0	140
P-S7-SG52-S	10-11	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<5.0	<50
P-S7-SG52-S F	10-11	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<5.0	<50
P-S7-SG53-S	5-7	<2.0	<2.0	<2.0	<0 .2	<0.2	<2.0	<2.0	<2.0	<5.0	55

APPENDIX A

FIELD DATA LOG SHEETS

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Soil-Gas Sampling Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA ANG

Sheet 1 of 11
Crew Chief J.Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	P-S7-SG-02 ~~P-S7-SG-02~~	SG-02	SG-05	SG-04	SG-01	SG-12
Date:	11/8/94	11/8/94	11/8/94	11/8/94	11/8/94	11/9/94
Time:	3:20	3:35	3:55	4:13	7:23	8:03
Sample Number:	#1	—	#2	#3	#4	#5
Depth	5ft	10ft	5ft	5ft	5ft	5ft
Purge Vacuum (in./Hg-H20)	~~25~~ 15	15	15	15	15	15
Purge Volume (L.)	2L	—	2L	2L	2L	2L
Sample Vacuum (in./H2O)	9	—	9	9	9	9
Sample Volume	125ml	125ml	125ml	125ml	125ml	125ml
Sample Taken By:	J.Olsen	J.Olsen	J.Olsen	J.Olsen	J.Olsen	J.Olsen
COMMENT	≈40 sec purge time	No Sample Taken (Low permeability) Purge time	≈10 sec purge time (FIELD DUPLICATE)	≈20 sec. purge time	≈10 sec. purge time	≈4 min purge time

CHAIN OF CUSTODY

Samples Relinquished By:	**Lab Comments:**	**Sample Shipment:**
Date		Hand Delivered: (yes) no
Time		Shipped via:
Samples Received By:		Date Shipped: N/A
Date		Shipper's Signature: TEO
Time		

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Soil-Gas Sampling Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA

Sheet 2 of 11
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	SG-12	SG-12	SG-12	SG-12	SG-20	SG-20
Date:	11/9/94	11/9/94	11/9/94	11/9/94	11/9/94	11/9/94
Time:	8:15	8:28	8:35	8:50	9:18	9:35
Sample Number:	#6	#7	—	—	#8	#9
Depth	10ft	15ft	20ft	—	5ft	10ft
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	15
Purge Volume (L.)	2L	2L	—	2L	2L	2L
Sample Vacuum (in./H2O)	9	9	—	9	9	9
Sample Volume	125ml	125ml	250ml	125ml	125ml	125ml
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
COMMENT	10 sec purge time - 2 min equil. bration time	≈ 10 sec purge time	Refusal at 15.5 ft bgs	<NO SAMPLE TAKEN> FOL Site Air Blank	≈ 90 sec purge time	≈ 3 min purge time

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: yes no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature: JFO
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Soil-Gas Sampling Field Log Sheet

CLIENT: TETC
LOCATION: Pittsburgh, PA ANG

Sheet 3 of 11
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	SG-17	SG-17	SG-16	SG-16	SG-18	SG-18
Date:	11/9/94	11/9/94	11/9/94	11/9/94	11/9/94	11/9/94
Time:	10:38	10:43	11:37	12:04	1:43	2:01
Sample Number:	—	#10	#12	—	#13	#14
Depth	5ft	10 ft	5ft	10ft	5ft	10 ft
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	15
Purge Volume (L.)	—	2L	2L	—	2L	2L
Sample Vacuum (in./H2O)	—	9	9	—	9	9
Sample Volume	—	125ml	125ml	—	125ml	125ml
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen

COMMENT

Low permeability
<NO SAMPLE TAKEN>
≈20 sec purge time
≈10 sec purge time
Water at ≈3ft
Water on rods and soil gas
<NO SAMPLE TAKEN>
≈20 sec purge time
≈4 min purge time
Refusal at 10 ft.

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**
Date		
Time		
Samples Received By:		
Date		
Time		

Sample Shipment:
Hand Delivered: (yes) no
Shipped via: —
Date Shipped: N/A
Shipper's Signature: JEO

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Soil-Gas Sampling Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA ANG

Sheet 4 of 11
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	SG-25	SG-34	SG-33	SG-32	SG-08	SG-06
Date:	11/9/94	11/9/94	11/9/94	11/9/94	11/10/94	11/10/94
Time:	2:25	2:53	3:15	3:45	7:53	8:21
Sample Number:	~~#~~	#16	#17	#18	#19	#20
Depth	5ft	5ft	5ft	~~5ft~~ 15ft	5ft	18ft
Purge Vacuum (in./Hg-H20)	.15	15	15	15	15	15
Purge Volume (L.)	~~2L~~	2L	2L	2L	2L	2L
Sample Vacuum (in./H2O)	~~9~~	9	9	9	9	9
Sample Volume		125ml	125ml	250ml	125ml	125ml
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
COMMENT	Water at 15ft <NO SAMPLE TAKEN>	≈ 90 sec purge time	≈ 10 sec purge time	≈ 4 min purge time	≈ 10 sec purge time	≈ 10 sec purge time

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: yes no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature: TEO
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Soil-Gas Sampling Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA ANG

Sheet 5 of 11
Crew Chief J. Olsen
Unit No. #7
Job No. 1194004

Probe Location I.D.	SG-03	SG-07	SG-10	SG-11	SG-19	SG-26
Date:	11/10/94	11/10/94	11/10/94	11/10/94	11/10/94	11/10/94
Time:	8:50	9:21	10:15	10:35	10:50	11:25
Sample Number:	#21	#22	#23	#24	#25	#27
Depth	15ft	12ft	8.5ft	9ft	9ft	9ft
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	15
Purge Volume (L.)	2L	2L	2L	2L	2L	2L
Sample Vacuum (in./H2O)	9	9	9	9	9	9
Sample Volume	250 ml	125ml	125ml	125ml	125ml	125ml
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
COMMENT	≈ 2.5 min purge time	≈ 30 sec. purge time	≈ 20 sec. purge time	≈ 20 sec purge time	≈ 20 sec. purge time	≈ 20 sec. purge time

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered (yes) no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature: JFO
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Soil-Gas Sampling Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA ANG

Sheet 6 of 11
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	SG-15	SG-24	SG-31	SG-36	SG-40	SG-43
Date:	11/10/94	11/10/94	11/10/94	11/11/94	11/11/94	11/11/94
Time:	12:00	2:43	3:10	8:02	8:56	9:00
Sample Number:	#28	#30	#31	#32	#33	#34
Depth	9 ft	6 ft	6 ft	5 ft	3 ft	5 ft
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	15
Purge Volume (L.)	2L	2L	2L	2L	2L	2L
Sample Vacuum (in./H2O)	9	9	9	9	9	9
Sample Volume	125ml	125ml	125 ml	125 ml	125ml	125ml
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
COMMENT	≈4 min purge time Initial interval 9-7 ft. Pulled up rods an additional 2 ft.	≈10 sec. purge time	≈4 min purge time Very tight soils	≈10 sec purge time <FIELD DUPLICATE>	≈10 sec. purge time Refusal at 3 ft.	≈10 sec purge time

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: (yes) no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature:
Time			

D

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Soil-Gas Sampling Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA ANG

Sheet 7 of 11
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	SG-43	SG-43	SG-46	SG-46	SG-39	SG-22
Date:	11/11/94	11/11/94	11/11/94	11/11/94	11/11/94	11/11/94
Time:	9:20	9:50	10:36	10:53	11:23	2:20
Sample Number:	#35	#36	#38	—	#39	#40
Depth	10 ft	~~15~~ 13 ft	5 ft	10 ft	5 ft	9 ft
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	15
Purge Volume (L.)	2L	2L	2L	2L	2L	2L
Sample Vacuum (in./H2O)	9	9	9	9	9	9
Sample Volume	125ml	125ml	125ml	125ml	125ml	250ml
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
COMMENT	≈20 sec. purge time	≈20 sec purge time, small amount of water pulled into tubing	≈2 min purge time	Reached water between 10-7ft. <END SAMPLE TAKEN>	≈ 90 sec purge time	≈ 20 sec. purge time <FIELD DUPLICATE>

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: (yes) no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature: JEO
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Soil-Gas Sampling Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA ANG

Sheet 8 of 11
Crew Chief J. Olsen
Unit No. #2
Job No. 194004

Probe Location I.D.	SG-35	SG-38	SG-41	SG-44	SG-42	SG-47
Date:	11/11/94	11/11/94	11/11/94	11/11/94	11/12/94	11/12/94
Time:	2:40	3:10	3:30	3:46	8:56	9:14
Sample Number:	#41	#42	#43	#44	#45	#46
Depth	8.5ft	7 ft	10 ft	5.5ft	8 ft	12 ft
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	15
Purge Volume (L.)	2L	2L	2L	2L	2L	2L
Sample Vacuum (in./H2O)	9	9	9	9	9	9
Sample Volume	125ml	125ml	125ml	125ml	125ml	125ml
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
COMMENT	≈3 min purge time	Refusal at 8.5 ft.	≈10 sec purge time	FIELD DUPLICATE ≈20 sec. purge time	≈90 sec. purge time Refusal at 5.5 ft	≈10 sec. purge time	Refusal at 8 ft ≈10 sec. purge time

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: (yes) no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature: JEO
Time			

D

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Soil-Gas Sampling Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA ANG

Sheet 9 of 11
Crew Chief J. Olsen
Unit No. #2
Job No. 11.94004

Probe Location I.D.	SG-45	SG-49	SG-51	SG-51	SG-53	SG-54
Date:	11/12/94	11/12/94	11/14/94	11/14/94	11/14/94	11/14/94
Time:	9:32	10:36	9:36	9:46	1:38	2:07
Sample Number:	#47	#48	#57	#58	#61	#62
Depth	5.5ft	7ft	5ft	9.5ft	6ft	12ft
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	15
Purge Volume (L.)	2L	2L	2L	2L	2L	2L
Sample Vacuum (in./H2O)	9	9	9	9	9	9
Sample Volume	125ml	125ml	125ml	125ml	125ml	125ml
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
COMMENT	≈10 sec purge time	Refusal at 5.5ft ≈20 sec. purge time	Refusal at 7ft ≈2 min purge time	≈2 min purge time Refusal at 9.5ft	≈10 sec purge time	≈10 sec purge time

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**
Date		
Time		
Samples Received By:		
Date		
Time		

Sample Shipment
Hand Delivered: (yes) no
Shipped via: N/A
Date Shipped:
Shipper's Signature: JEO

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Soil-Gas Sampling
Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA ANG

Sheet 10 of ~~10~~ 11
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	SG-55	SG-56	SG-57	SG-57	SG-58	SG-59
Date:	11/14/94	11/15/94	11/15/94	11/15/94	11/15/94	11/15/94
Time:	4:52	7:39	7:55	8:05	9:27	9:57
Sample Number:	#66	#67	#68	—	#70	#71
Depth	12 ft	10 ft	9 ft	5 ft	4 ft	6 ft
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	15
Purge Volume (L.)	2L	2L	2L	—	2L	2L
Sample Vacuum (in./H2O)	9	9	9	—	9	9
Sample Volume	125ml	125ml	125ml	125ml	125ml	125ml
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen

COMMENT

SG-55: ~~Post~~ ≈ 45 sec. purge time

SG-56: ≈ 20 sec. purge time

SG-57: ≈ 30 sec purge time

SG-57: water near 9 ft. Groundwater sample taken. <NO SAMPLE TAKEN>

SG-58: ≈ 10 sec. purge time Refusal at 4 ft

SG-59: ≈ 10 sec. purge time <FIELD DUPLICATE>

CHAIN OF CUSTODY

Samples Relinquished By: Date N/A Time		**Lab Comments:**
Samples Received By: Date N/A Time		

Sample Shipment:
Hand Delivered: (yes) no
Shipped via: N/A
Date Shipped: N/A
Shipper's Signature: JEO

D

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Soil-Gas Sampling
Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA ANGB

Sheet 11 of 11
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	SG-48	SG-50	SG-61	SG-60		
Date:	11/15/94	11/16/94	11/17/94	11/17/94		
Time:	3:20	8:30	8:15	9:10		
Sample Number:	#78	#80	#99	#100		
Depth	9.5ft	9ft	9ft	5ft		
Purge Vacuum (in./Hg-H20)	15	15	15	15		
Purge Volume (L.)	2L	2L	2L	2L		
Sample Vacuum (in./H2O)	9	9	9	9		
Sample Volume	125ml	125ml	125ml	125ml		
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen		
COMMENT	≈ 10 sec purge time	≈ 20 sec. purge time	≈ 10 sec purge time	≈ 10 sec purge time (low permeability) 5-4' interval pulled rods to 3ft.		

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered (yes) no
Time			Shipped via: N/A
Samples Received By:			Date Shipped:
Date			Shipper's Signature: JEO
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Groundwater Sampling Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA ANG

Sheet 1 of 5
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Date	11/9/94	11/9/94	11/10/94	11/10/94	11/11/94	11/12/94
Well-Point Location I.D.	~~900~~ P-57-SG-17-W	SG-25-W	SG-19-W	SG-15-W	SG-43-W	PZ-15
Well-Point Information:						
Length of Probe Rod (ft.)	10ft	5ft	9ft	9ft	~~15~~ 13ft	11.5ft
Total Depth * (ft.)	10ft	5ft	9ft	9ft	13ft	11.5ft
Depth to Water * (ft.)	≈9ft	4ft	≈8ft	≈8ft	~~≈11ft~~	
Volume in Well point (l.)	—	—	—	—		
Sampling Information:		Strong Odor				
Turbidity Before Purging	High	Mod	Mod	Mod	High	
Volume Purged	—	—	—	—	—	
Turbidity After Purging	—	—	—	—	—	
Purged Dry? (Y/N)	N	N	N	N	N	
Purging Method	F.V.	F.V.	F.V.	F.V.	F.V.	
Sampling Method	F.V.	F.V.	F.V.	F.V.	F.V.	
Time of Sampling	11:00	2:38	11:00	12:10	10:12	10:49
Samples Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
Sample Information:						
Sample No.	#11	#15	#26	#29	#37	#49
Number - Volume (mls.)	~~5~~ 40ml	40ml	40ml	80ml	40ml	—
Type of Container (G/P)	VOA	VOA	VOA	VOA	VOA	—
Field Filtered (Y/N)	N	N	N	N	N	—
ESI Field Duplicate (Y/N)	~~Y~~ N	N	N	Y	N	—

HNU 20 METER

* Measured from surface of ground

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: (yes) no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature: JEO
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Groundwater Sampling Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA ANG

Sheet 2 of 5
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Date	11/12/94	11/12/94	11/12/94	11/12/94	11/12/94	11/12/94
Well-Point Location I.D.	PZ-6	PZ-4	SG-38-W	SG-35-W	SG-20-W	SG-12-W
Well-Point Information:					*	*
Length of Probe Rod (ft.)	9.5 ft	9 ft	8 ft	8 ft	8 ft	15 ft
Total Depth * (ft.)	9.5 ft	9 ft	8 ft	8 ft	18 ft	15 ft
Depth to Water * (ft.)	PIEZOMETER	PIEZOMETER	DRY	≈5 ft	~~Dry~~	—
Volume in Well point (l.)	—	—	—	—	—	—
Sampling Information:			NO SAMPLE		NO SAMPLE	NO SAMPLE
Turbidity Before Purging				LOW		
Volume Purged				120 ml		
Turbidity After Purging				LOW		
Purged Dry? (Y/N)			~~F.V.~~	~~F.V.~~ N		
Purging Method			F.V.	F.V.	F.V.	F.V.
Sampling Method			F.V.	F.V.	F.V.	F.V.
Time of Sampling	11:04	11:15	~~11:36~~	11:47	12:05	12:20
Samples Taken By:	J. Olsen	J. Olsen	~~J. Olsen~~	J. Olsen	J. Olsen	J. Olsen
Sample Information:						
Sample No.	#50	#51	~~#~~	#52	# —	—
Number - Volume (mls.)	—	—	—	40 ml	—	—
Type of Container (G/P)	—	—	—	VOA	—	—
Field Filtered (Y/N)	—	—	—	N	—	—
ESI Field Duplicate (Y/N)	—	—	—	N	—	—

* Both locations were wet soils, but did not be collected. Very silty soils

* Measured from surface of ground

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered (yes) no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature: JEO
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Groundwater Sampling
Field Log Sheet

CLIENT: TETC

LOCATION: Pittsburgh, PA ANG *

Sheet 3 of 5
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Date	11/12/94	11/12/94	11/15/94	11/15/94	11/16/94	11/16/94
Well-Point Location I.D.	~~SG-PZ-2~~	PZ-3	SG-57-W	PZ-5W	SG-50-W	SG-53-W
Well-Point Information:						
Length of Probe Rod (ft.)	14ft	13ft	5ft	11.5ft	9ft	7ft
Total Depth * (ft.)	14ft	11ft	5ft	11.5ft	9ft	7ft
Depth to Water * (ft.)			≈ 4ft	3ft	4.8ft	—
Volume in Well point (l.)			—	—	—	—
Sampling Information:						
Turbidity Before Purging			Low	Mod	Mod	
Volume Purged			—	—	—	
Turbidity After Purging			—	—	—	
Purged Dry? (Y/N)			Y	N	N	
Purging Method			F.V.	F.V.	F.V.	
Sampling Method			F.V.	F.V.	F.V.	F.V.
Time of Sampling	12:36	1:17	8:22	3:54	8:40	9:30
Samples Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
Sample Information:						
Sample No.	#53	#54	#69	#79	#81	—
Number - Volume (mls.)	—	—	40ml	40ml	40ml	—
Type of Container (G/P)	—	—	VOA	VOA	VOA	—
Field Filtered (Y/N)	—	—	N	N	N	—
ESI Field Duplicate (Y/N)	—	—	N	N	N	—

PIEZOMETER

PIEZOMETER

Strong Odor

Odor

NO WATER

* Measured from surface of ground

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: yes no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature: JEO
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Groundwater Sampling
Field Log Sheet

CLIENT: TETC
LOCATION: Pittsburgh, PA ANGB

Sheet 4 of 5
Crew Chief J.Olsen
Unit No. #2
Job No. 11.94004

Date	11/16/94	11/16/94	11/16/94	11/17/94	11/17/94	11/10/94
Well-Point Location I.D.	SG-45-W	SG-50-W	SG-16-W	SG-60-W	SG-64-W	SG-11-W
Well-Point Information:		B				
Length of Probe Rod (ft.)	5ft	9ft	5ft	9ft	5ft	9ft
Total Depth * (ft.)	5ft	9ft	5ft	9ft	5ft	9ft
Depth to Water * (ft.)	3.8ft	3.0ft	~2ft	1ft	1ft	~~8ft~~ 5ft
Volume in Well point (l.)	—	—	—	—	—	—
Sampling Information:						
Turbidity Before Purging	Mod	Mod	Mod	Mod	Mod	Mod
Volume Purged	—	—	—	—	—	—
Turbidity After Purging	—	—	—	—	—	—
Purged Dry? (Y/N)	N	N	N	N	N	N
Purging Method	F.V.	F.V.	F.V.	F.V.	F.V.	F.V.
Sampling Method	F.V.	F.V.	F.V.	F.V.	F.V.	F.V.
Time of Sampling	10:25	2:00	3:10	9:20	9:25	3:30
Samples Taken By:	J.Olsen	J.Olsen	J.Olsen	J.Olsen	J.Olsen	J.Olsen
Sample Information:						
Sample No.	~~#84~~	#89	#92	#101	#102	#103
Number - Volume (mls.)	40ml	40ml	40ml	40ml	40ml	40ml
Type of Container (G/P)	VOA	VOA	VOA	VOA	VOA	VOA
Field Filtered (Y/N)	N	N	N	N	N	N
ESI Field Duplicate (Y/N)	N	N	N	N	N	N

* Measured from surface of ground

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: (yes) no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature: JEO
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Groundwater Sampling
Field Log Sheet

CLIENT: TETC
LOCATION: Pittsburgh, PA

Sheet 5 of 5
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Date	11/12/94					
Well-Point Location I.D.	PZ-1					
Well-Point Information:						
Length of Probe Rod (ft.)	≈15ft					
Total Depth * (ft.)	≈15ft					
Depth to Water * (ft.)	DRY					
Volume in Well point (l.)	—					
Sampling Information:						
Turbidity Before Purging	NEGLIGIBLE					
Volume Purged						
Turbidity After Purging						
Purged Dry? (Y/N)						
Purging Method						
Sampling Method	BAILER					
Time of Sampling	12:55					
Samples Taken By:	J. Olsen					
Sample Information:						
Sample No.	#104					
Number - Volume (mls.)	—					
Type of Container (G/P)	—					
Field Filtered (Y/N)	—					
ESI Field Duplicate (Y/N)	—					

* Measured from surface of ground

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: (yes) no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature: JEO
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Subsurface Soil Sampling
Field Log Sheet

CLIENT: TETC
LOCATION: Pittsburgh, PA ANG

Sheet 1 of 5
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	SG-37-S	SG-30-S	SG-29-S	~~SG-52-S~~ SG-295	SG-52-S	SG-52-S
Date:	11/11/94	11/14/94	11/14/94	11/14/94	11/14/94	11/14/94
Time:	4:19	7:32	8:01	10:21	11:00	10:40
Sample Number:	#45	#55	#56	#59	~~#60~~	#60
Depth (top of sample):	5-7'	.5-1.5ft	.5-1.0ft	5-7'	15-17'	10-11'
Estimated Sample Volume:	300gms	100gms	50gms	300gms	—	200gms
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
Sample Description						
COMMENTS	Grey-brown silt fill	Grey silt w/ pebbles rock at bottom Shale Refusal at 1.5ft	Same as above Refusal at 1.0ft	Brown to tan clay w/ some silt	Refusal at 11.5 ft SAMPLE TAKEN	Brown silt w/ some pebbles FIELD DUPLICATE

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: yes / no
Time			Shipped via: N/A
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature: JEC
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Subsurface Soil Sampling
Field Log Sheet

CLIENT: TETC
LOCATION: Pittsburgh, PA ANG

Sheet 2 of 5
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	SG-14-S	SG-12-S	SG-20-S	P-57-B-01 ~~SG~~	B-01	B-01
Date:	11/14/94	11/14/94	11/14/94	11/15/94	11/15/94	11/15/94
Time:	2:56	3:30	4:05	10:00	10:30	11:05
Sample Number:	#63	#64	#65	#71	#72	—
Depth (top of sample):	5-7.5'	8-9'	8-9'	4-6'	9-11'	13-15'
Estimated Sample Volume:	200gms	200gms	200gms	300gms	300gms	—
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
Sample Description					colocated w/ SG-54	colocated w/ SG-54
COMMENTS	#Grey silt w/ some fragments FIELD DUPLICATE	Grey-brown silt w/ some clay + gravel	Same as above	Brown to tan sand + clay No Analysis	Brown clay No Analysis	Refusal at 12.5' No Analysis NO SAMPLE TAKEN

CHAIN OF CUSTODY

Samples Relinquished By: Date Time		**Lab Comments:**
Samples Received By: Date		

Sample Shipment:
Hand Delivered: (yes) no
Shipped via: N/A
Date Shipped:
Shipper's Signature:

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Subsurface Soil Sampling
Field Log Sheet

CLIENT: TETC
LOCATION: Pittsburgh, PA ANGB

Sheet 3 of 5
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	B-07	B-08	B-08	B-09	SG-53-S ~~SG-53~~	B-10
Date:	11/15/94	11/15/94	11/15/94	11/15/94	11/16/94	11/16/94
Time:	12:45	1:30	1:59	2:20	9:15	10:10
Sample Number:	#73	#74	#75	#76	#82	#83
Depth (top of sample):	5-7'	5-7'	9-11'	3-5'	5-7'	3-5'
Estimated Sample Volume:	400gms	400gms	400gms	300gms	300gms	400gms
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
Sample Description	colocated w/SG-42	colocated w/SG-43	colocated w/SG-43	colocated w/SG-44		colocated w/SG-45
COMMENTS	Tan to reddish brown clay, crumbly No Analysis	Acetate liner Field Disruption Only No Analysis	Brown to tan clay, dense, crumbly No Analysis	Brown to tan silty clay, dense + crumbly No Analysis	Brown to tan clay, dense + crumbly Shale at bottom Refusal at ≈ 7'4"	Same as above No Analysis

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: yes no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's ~~Signature~~: JEO
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Subsurface Soil Sampling
Field Log Sheet

CLIENT: FTC

LOCATION: Pittsburgh, PA ANGB

Sheet 4 of 5
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	B-11	B-11	B-12 ~~B-11~~	B-12 ~~B-11~~	B-13	~~B-02~~ B-13
Date:	11/16/94	11/16/94	11/16/94	11/16/94	11/16/94	11/16/94
Time:	~~10:45~~	10:55	1:30	1:50	2:30	2:50
Sample Number:	#85	#86	#87	#88	~~#90~~	#91
Depth (top of sample):	3-5	7-9	3-5'	7-9'	~~3-6'~~	3-5'
Estimated Sample Volume:	400gms	300gms	~~3~~400gms	300gms	300gms	300gms
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
Sample Description	colocated w/SG-57	colocated w/SG-51	colocated w/SG-50	colocated w/SG-50	colocated w/SG-48	colocated w/SG-16

COMMENTS

Brown clay w/ some silt + sand
Probed location twice for Sufficient Volume
No Analysis
Light brown silt w/ pebbles
Earth Tech Lab Dup
Probed location twice for Sufficient Volume
No Analysis
Brown to green brown clay w/ some pebbles
Earth Tech Lab Dup
Probed location twice for Sufficient Volume
No Analysis
Brown light brown silt
No Analysis
~~Clay~~ Green gray silt + clay, dense
No Analysis
Brown silt w/ pebbles + some clay
No Analysis

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: yes no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature:
Time			

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Subsurface Soil Sampling
Field Log Sheet

CLIENT: TETC
LOCATION: Pittsburgh, PA ANGB

Sheet 5 of
Crew Chief J. Olsen
Unit No. #2
Job No. 1194004

Probe Location I.D.	B-06	B-06	B-04	B-02	B-02	B-14
Date:	11/16/94	11/16/94	11/16/94	11/16/94	11/16/94	11/16/94
Time:	3:45	3:55	4:05	4:30	4:45	5:05
Sample Number:	#93	#94	#95	#96	#97	#98
Depth (top of sample):	3-5'	7-9'	3-5'	3-5'	7-9'	2-4'
Estimated Sample Volume:	300gms	300gms	300gms	300gms	300gms	300gms
Sample Taken By:	J.Olsen	J.Olsen	J.Olsen	J.Olsen	J.Olsen	J.Olsen
Sample Description	colocated w/ SG-57	colocated w/SG-57	colocated w/ SG-25	colocated w/ SG-20	colocated w/SG-20	colocated w/SG-58
COMMENTS	Brown to tan clay No Analysis	Brown clay No Analysis	Dk. brown silt No Analysis	Brown to green brown clay w/ pebbles No Analysis	Brown to tan clay w/ some sand, silt, some pebbles No Analysis	Light brown silt No Analysis

CHAIN OF CUSTODY

Samples Relinquished By:		**Lab Comments:**	**Sample Shipment:**
Date			Hand Delivered: (yes) no
Time			Shipped via:
Samples Received By:			Date Shipped: N/A
Date			Shipper's Signature:
Time			

SITE INVESTIGATION REPORT:
SOIL-GAS AND SOIL SURVEY
PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH, PENNSYLVANIA

Prepared for:

The Earth Technology Corporation
1420 King Street, Suite 600
Alexandria, Virginia 22314

Prepared by:

EnviroSurv, Inc.
2800-C Dorr Avenue
Fairfax, Virginia 22031

September 29, 1995

I PROJECT SUMMARY

The report findings presented herein, represent partial actions taken to further identify problems with potentially contaminated sites at the Pittsburgh, Pennsylvania Air National Guard Base (ANGB). Prior to soil-gas and soil sampling and analysis, Earth Tech performed a preliminary assessments of Site A, Site B and Site 7 at the subject Air National Guard facility. This effort included a surface reconnaissance and historical records/data survey (e.g., a previous limited soil-gas survey was performed in 1991) for evidence of possible contamination. Information from this records review and site reconnaissance were used to design the more detailed soil-gas and soil survey described herein.

Major Findings

II PROJECT OBJECTIVES

Soil-gas samples were taken to assess the general extent of contamination at two site locations, Site 7 and Site A. Based on soil-gas results, soil sample locations were selected for further characterization. Soil samples were also collected and analyzed from Site B. See **Figures 1,2, & 3** for site maps and sampling locations.

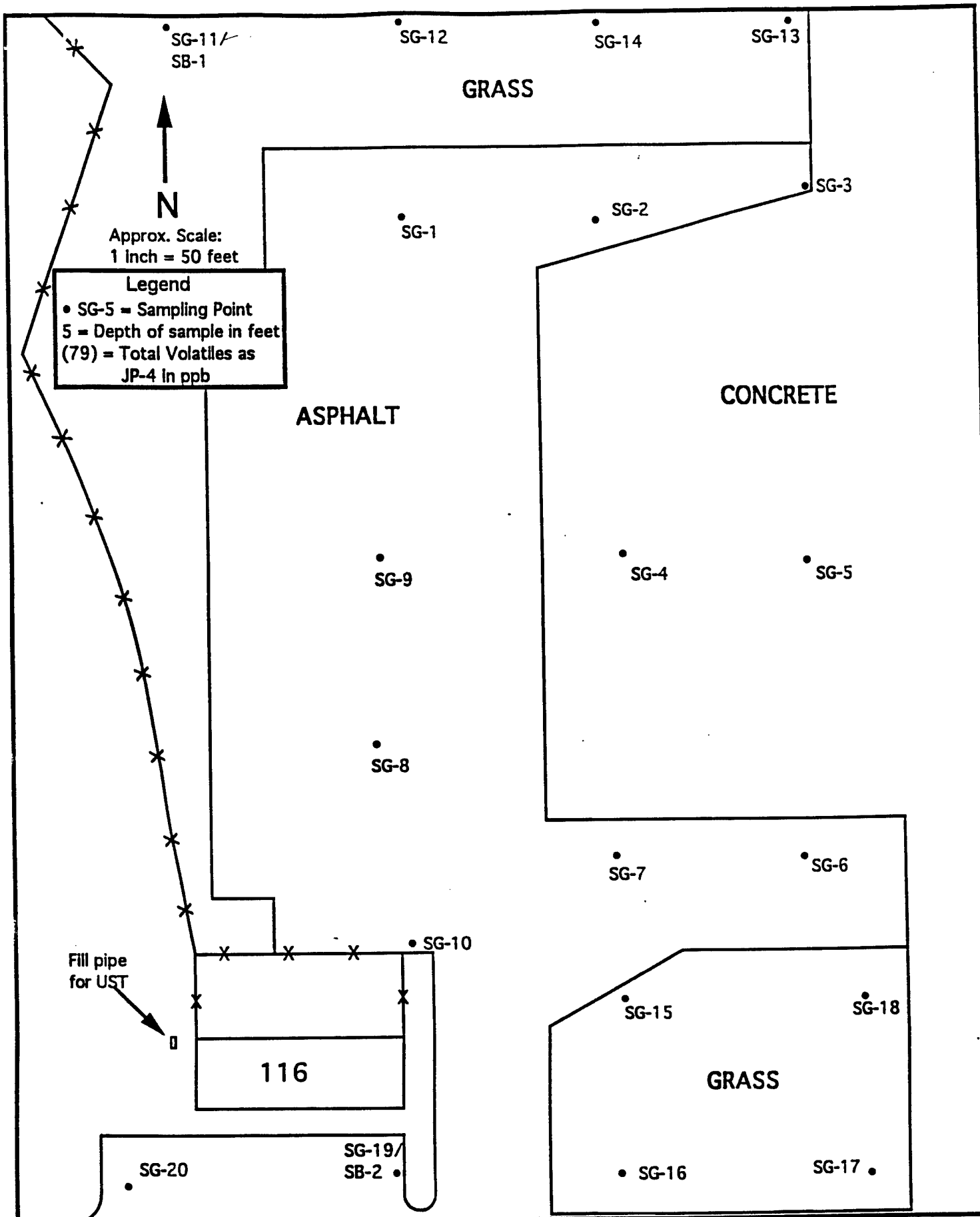
The following target VOC compounds (and respective quantitation limits) were analyzed in all soil-gas and soil samples and decon water:

	Quantitation Limits		
	Soil-gas (ppm)	Water (ppb)	Soil (ppb)
• Benzene	0.50	2.0	2.0
• Toluene	0.50	2.0	2.0
• Ethylbenzene	0.50	2.0	2.0
• Total Xylenes	1.0	2.0	5.0
• Total JP-4 Volatiles	20.0	50.0	50.0
• trans-1,2-DCE	0.5	10.0	10.0
• cis-1,2-DCE	0.5	10.0	10.0
• 1,2-DCA	0.5	10.0	10.0
• TCE	0.02	0.5	0.5
• PCE	0.02	0.5	0.5

III FIELD SAMPLING AND MOBILE LABORATORY PROCEDURES

Sampling Survey Design

Earth Tech surface reconnaissance of the three sites and data from a previous site investigation performed by EnviroSurv, Inc. helped in the soil-gas and soil sampling survey design. In general, the soil-gas and soil locations were chosen according to specific site features and using the data from previous investigations as directed by Earth Tech's on-site representative.



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Fairfax, VA 22031

Figure 1: Pennsylvania ANG Site A Base Map and Sampling Locations

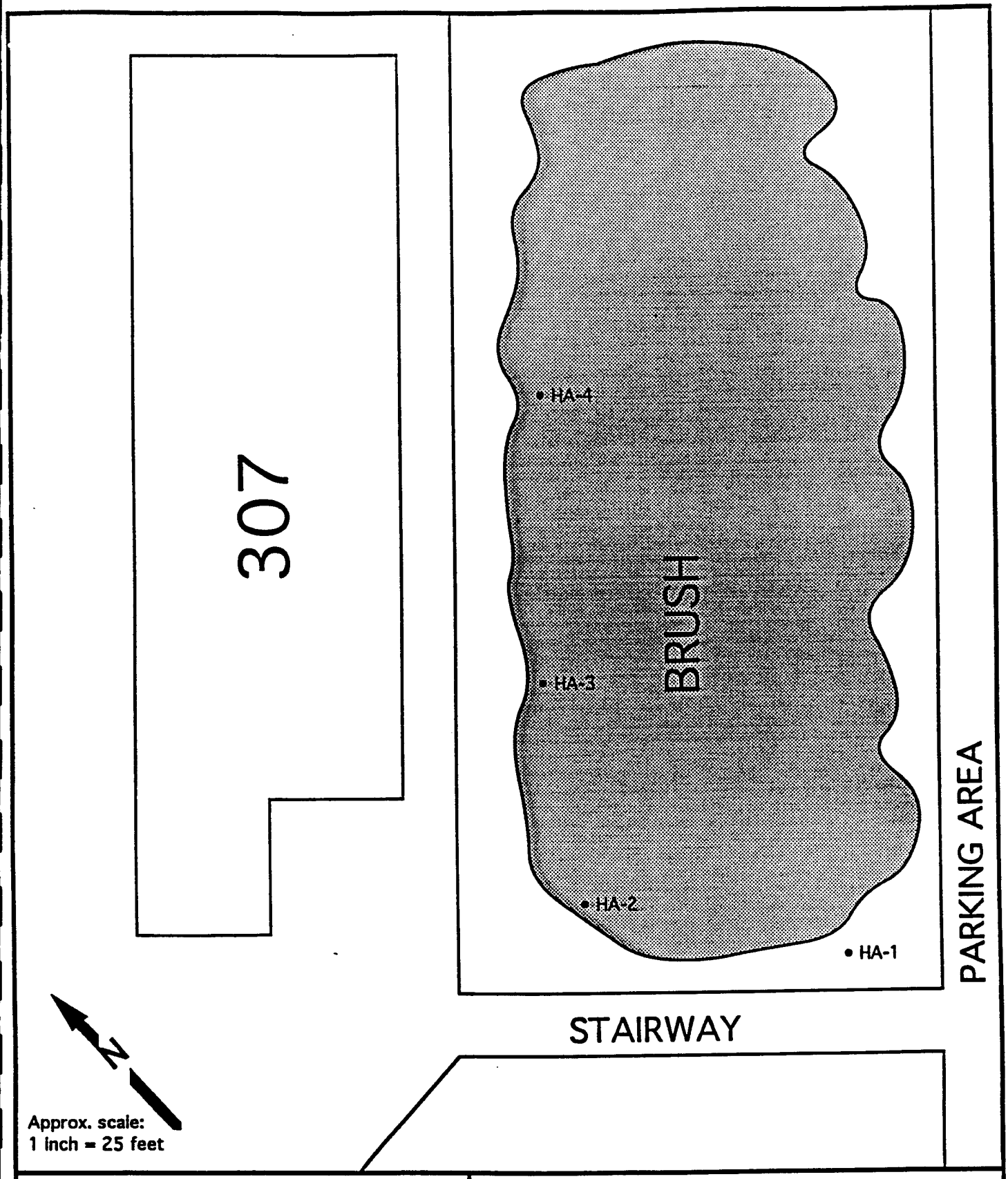

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Figure 2: Pennsylvania ANG Site B
Base Map and Sampling
Locations

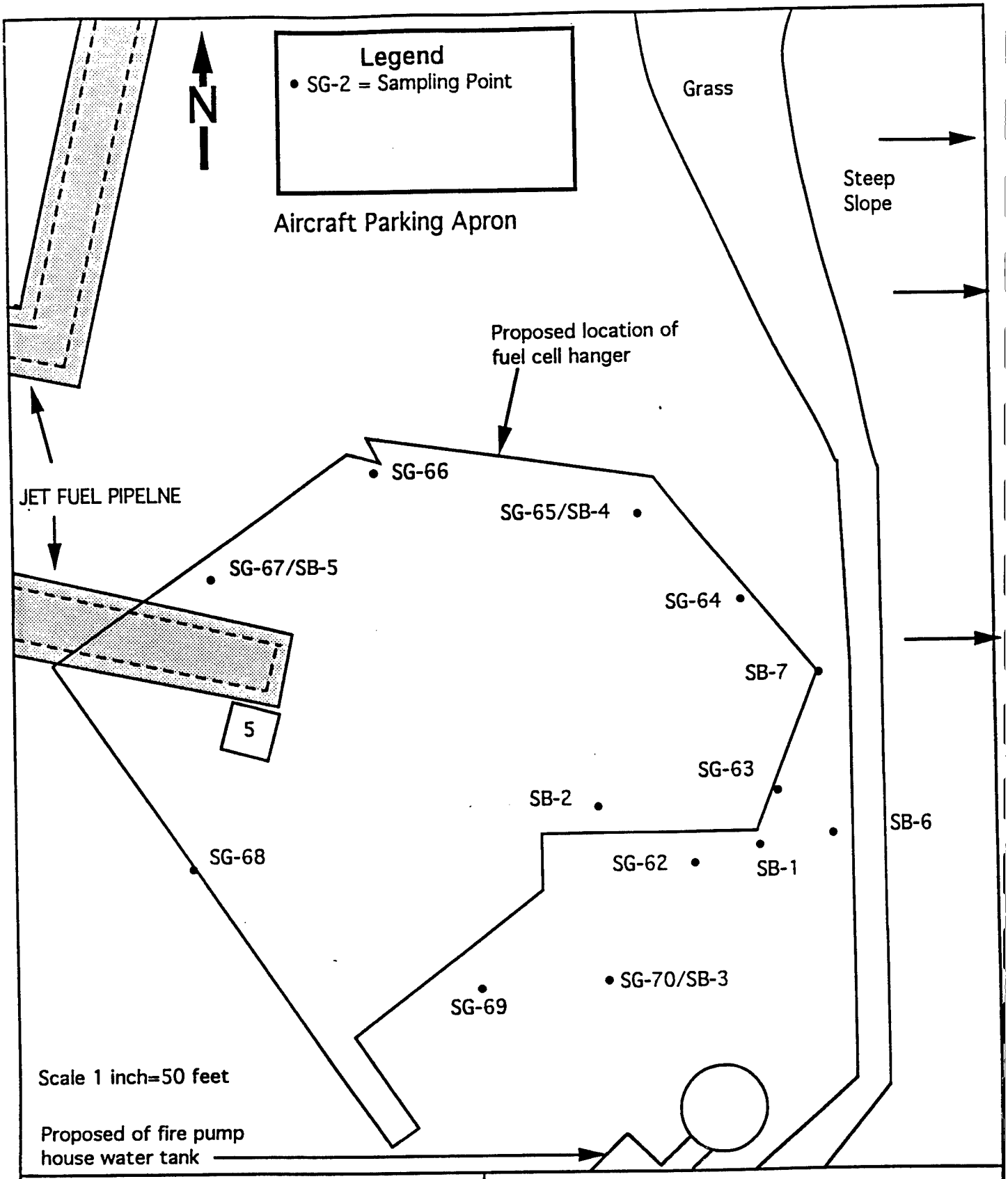

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Figure 3.Pennsylvania ANG,Pittsburgh Site 7 Base Map and Sampling Locations

Field Activities

EnviroSurv, Inc.'s two-man probe sampling and mobile laboratory analysis team documented all field activities on both Field Sample Log Sheets and in Field Laboratory Notebooks. Information pertinent to sample collection (e.g., depth, volume, etc.) and analysis (e.g., QA /QC, target compounds identified, etc.) were recorded.

Field Sampling Procedures and QA/QC Protocols

Probe Placement: Sampling probes are constructed of 1/2-inch I.D. hardened steel in 3-foot lengths. The probe rods were driven into the soil by a hydraulic cylinder/percussion hammer unit mounted in the back of a 4-wheel-drive pickup truck. Probes were removed using the same hydraulic system. Asphalt and/or concrete penetration was required at many of the sample locations. A compressor-activated rock drill was used to auger a 1.5 inch pilot hole through pavement as needed. The 3/4-inch outside diameter probe rod was then placed in the pilot hole and driven to depth. All information pertinent to the collection of field samples can be found on the Field Log Sheets in Appendix A.

Soil-Gas Sample Collection: Once the soil-gas probe was driven to the desired sampling depth (3.5 to 15 feet bgs), "post run" polypropylene tubing was attached to the lead rod via a threaded sample cap with o-ring (to prevent vacuum leakage). The dedicated sample line was then attached to the vacuum volume system located in the probe truck. A minimum of three tubing/sample container volumes (e.g., 2 liters) were purged before a sample was collected in a glass gas-sample bulb with Teflon stopcocks. Once filled, the glass gas-sample bulbs were delivered immediately to the on-site laboratory for analysis. The estimated time from sample extraction to gas chromatograph injection was usually less than one to two hours. Collection of soil gas in glass bulbs permitted sample dilutions and laboratory duplicate analyses to be run from the same sample location, as required.

Soil Sample Collection: Once the 1.5-inch wide by 2-foot long piston soil sampler (with either acetate or stainless steel liner) was driven to the top of the desired sampling depth, the piston was released via an extension rod inserted down the probe rod. With the core barrel free to move, the probe rod was driven an additional 2-feet to collect approximately 300-400 grams of soil. Soil samples for on-site analysis were containerized in 40 ml VOA vials cleaned to EPA specifications. Once collected, the samples were immediately delivered to EnviroSurv, Inc.'s mobile laboratory. Split soil samples for off-site analysis were sealed in stainless steel liners using end caps and Teflon tape.

Field Duplicates: Two glass gas-sample bulbs or 40 ml VOA vials were filled at approximately 10% of the sampling points and treated as field duplicates to check the precision of sample collection procedures.

Equipment Decontamination: Dedicated polypropylene sampling line was used at each individual soil-gas sample location. Dedicated acetate or stainless steel liners were also used for each soil sample to avoid cross contamination. Once used, the tubing and liners were discarded or used to hold the samples (soils only). All non-expendable equipment which came in contact with extracted soil-vapor or soil samples was thoroughly cleaned before re-use. Decontamination procedures included an initial scrub and wash using wire brushes and alconox detergent and then steam cleaned using a hot water pressure washer to remove any remaining contamination. After washing, equipment was rinsed and deionized water and allowed to air dry.

Field Laboratory Procedures and QA/QC Protocols

Instrumentation: All samples collected during the Pittsburgh, Pennsylvania ANGB Survey were analyzed on a Shimadzu 14A laboratory-grade GC equipped with both Flame Ionization and Electron Capture Detectors (FID/ECD). The analytical column used was a 105 meter x 0.53 mm Restek R_tx-volatiles megabore capillary column. The GC was controlled by a Shimadzu CR4-AX integrating computer equipped with a 20 MB hard disk for method and data storage, and a thermal transfer printer for hard-copy output.

Sample Quantitation: The FID/ECD results for target aromatic and chlorinated volatiles were determined by calculating the areas of individual chromatogram peaks. Peaks resulting from injection disturbances (e.g., air peak) were carefully separated from the individual early eluting volatile peaks. The reported results for BTEX and chlorinated hydrocarbons in soil gas and soil were quantitated using the response factors obtained from certified commercial standards. The total JP-4 volatiles result was obtained by sample comparison with JP-4 standards prepared on-site from pure product.

Instrument Calibration: The gas chromatograph was initially calibrated for soil-gas, soil and water using a certified BTEX gas standard and/or field-prepared vapor or aqueous standards for the ten target compounds of interest (See **Figure 4**. - Example Standard Chromatograms). All standards preparation was documented in the field laboratory log book and is traceable back to certified commercial standards. Retention times of standards were used to identify the chromatogram peaks and response factors were used to calculate concentrations for target compounds of interest.

Laboratory Blanks: A method blank was run at the beginning of each day to check for potential contaminants in the analytical system. The blank was taken by withdrawing a headspace sample from an empty glass soil-gas bulb or 40 ml VOA vial containing deionized water. The sample was injected into the gas chromatograph in the same way as the samples.

Laboratory Duplicates: Approximately 10% laboratory duplicate samples were injected to check the analytical precision of the method.

Sample Preparation: Soil-gas samples were received in the laboratory in 125 or 250 ml

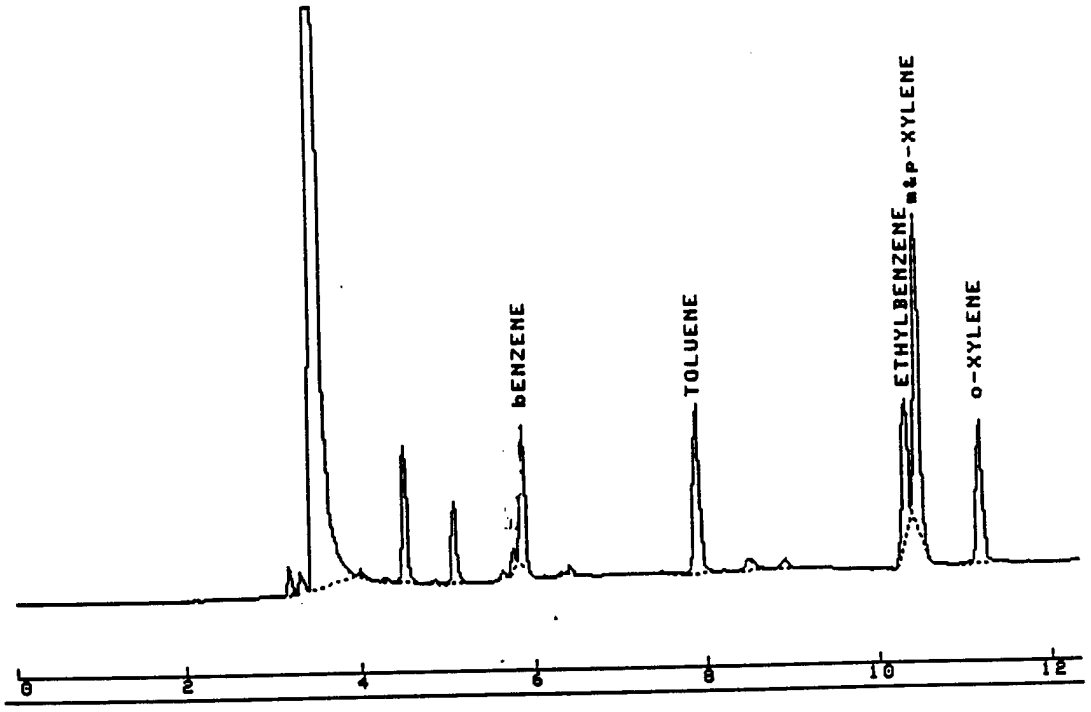


Figure 4. Example BTEX Standard Chromatogram

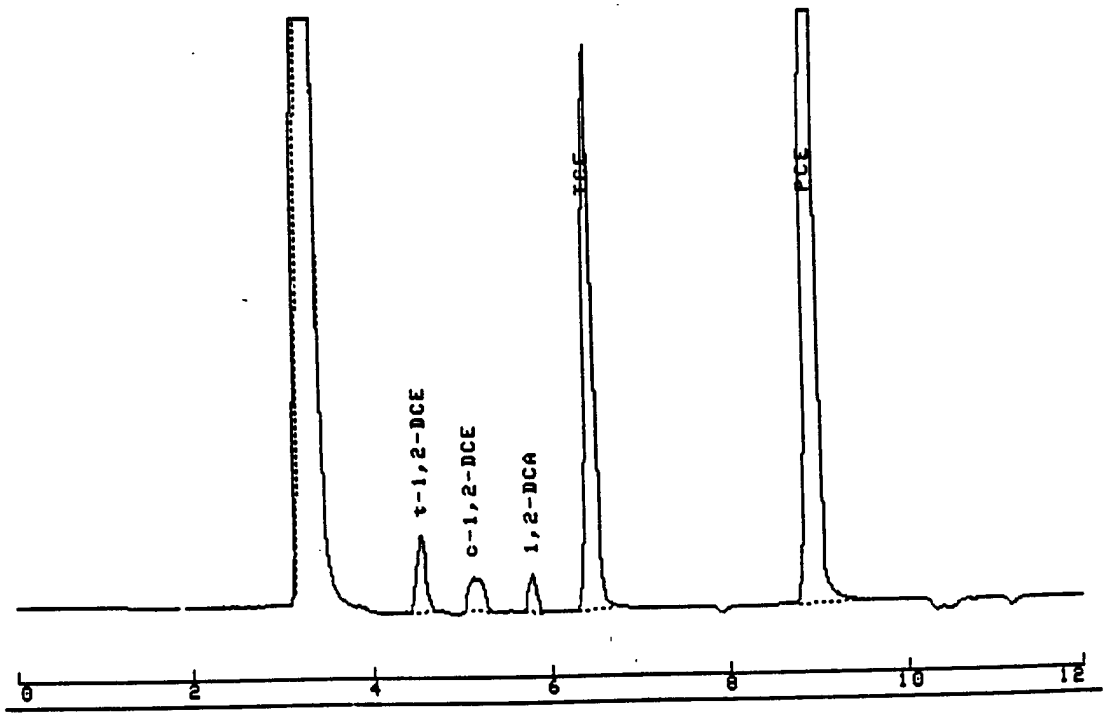


Figure 4. Example Chlorinated Solvent Standard Chromatogram

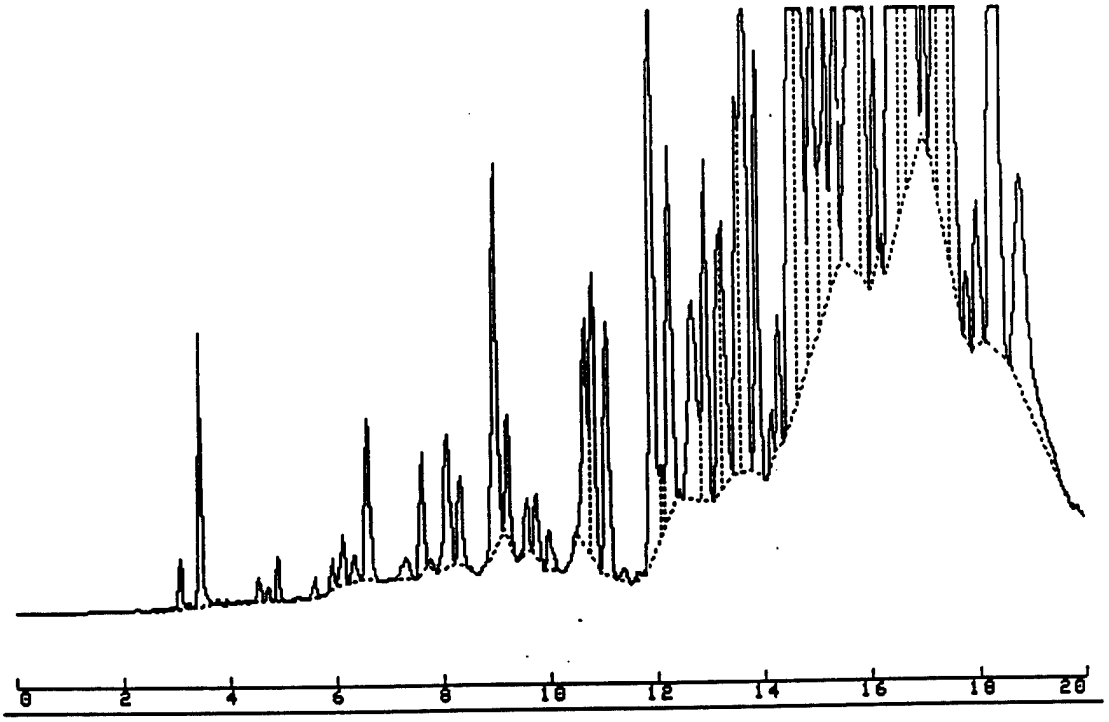


Figure 4. JP-4 Standard Chromatogram

glass gas sampling bulbs. A sample was withdrawn through the septum using a syringe and injected directly into the GC. Soil samples were received in the mobile lab in pre-weighed VOA vials. Approximately 20 to 30 grams were heated for 90 minutes at 90 degrees C before a headspace sample was taken using a gas-tight syringe.. Soil headspace was subsequently injected directly into the GC.

IV GENERAL INTERPRETATION OF FIELD SAMPLING AND MOBILE LABORATORY ANALYTICAL RESULTS

Sample results for soil-gas and soil samples for Site A, Site B, and Site 7, are in **Table 1** including QA/QC results. The soil-gas results for individual target chlorinated compounds, aromatic compounds and Total Volatiles (as JP-4) are expressed in ppm; soil data is expressed as µg/Kg the equivalent of ppb in soil.

Site A - **Figure 5.** shows the soil-gas sample results plotted next to the sampling locations at Site A. JP-4 volatiles were detected in soil-gas sample P-A-SG-19 at 5 feet bgs at a concentration of 2200 ppm. The Total Volatiles dropped to 900 ppm at this location at 8.5 feet bgs indicating the probability of a near surface spill. Additional levels of contamination were either moderate or not detected. No single source area of petroleum contamination was readily identifiable. "Hits" were distributed sporadically throughout the area in "bulls-eye" anomalies; evidence perhaps of several isolated "spills". The soil-gas results did not contain any chlorinated compounds detected at Site A.

"Significant" soil results (up to 35,000 ppb Total Volatiles) were found at SB-2 which is collocated with SG-19. This confirms the soil-gas "hit" at this location and the presence of contamination at this location. **Figure 6** shows the soil sample results for Site A.

TABLE 1. SOIL-GAS RESULTS

Soil gas values are expressed as ppm.

Sample I.D.	Depth , ft.	t-1,2-DCE	c-1,2-DCE	1,2-DCA	TCE	PCE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Volatiles, as JP-4
P-7-SG-62	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	67	<0.50	90	19000
P-7-SG-62	10	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	23	<0.50	11	13000
P-7-SG-62	15	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	14	<0.50	5.2	11000
P-7-SG-63	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	19	19000
P-7-SG-63	10	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	3.0	11000
P-7-SG-63	15	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	32
P-7-SG-63 L	15	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	22
P-7-SG-64	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	1.1	<0.50	21	1300
P-7-SG-64 L	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	1.0	<0.50	16	1300
P-7-SG-64	10	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	3.9	5400
P-7-SG-64	15	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	2.7	<0.50	1.1	4500
P-7-SG-64	18	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	1.2	320
P-7-SG-65	10	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	0.60	<0.50	<1.0	1400
P-7-SG-65 F	10	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	1.4	<0.50	<1.0	2100
P-7-SG-65	15	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	0.80	<0.50	<1.0	1300
P-7-SG-66	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	94
P-7-SG-66	9	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	150
P-7-SG-68	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	2.3	<0.50	8.5	330
P-7-SG-69	10	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	24
P-7-SG-69	15	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-7-SG-70	15	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	70
P-7-SG-70 F	15	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	48

TABLE 1. SOIL-GAS RESULTS

Soil gas values are expressed as ppm.

Sample I.D.	Depth , ft.	t-1,2-DCE	c-1,2-DCE	1,2-DCA	TCE	PCE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Volatiles, as JP-4
P-A-SG-1	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-1 L	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-1	9.5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	58
P-A-SG-2	2	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	79
P-A-SG-3	2.5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	30
P-A-SG-3 F	2.5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	32
P-A-SG-4	3	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-6	3	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-7	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	92
P-A-SG-8	3.5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	1.1	<20
P-A-SG-9	4	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-10	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-11	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-11	10	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-12	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-12 L	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-13	3	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-14	4	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-14 F	4	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-15	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-17	3	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-18	4.5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20
P-A-SG-19	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	18	<0.50	110	2200
P-A-SG-19	8.5	<0.5	<0.5	<0.5	<0.02	<0.02	12	6.5	<0.50	28	900
P-A-SG-20	5	<0.5	<0.5	<0.5	<0.02	<0.02	<0.50	<0.50	<0.50	<1.0	<20

TABLE 1. SOIL RESULTS

Soil values are expressed as ppb.

Sample I.D.		Depth , ft.	t-1,2-DCE	c-1,2-DCE	1,2-DCA	TCE	PCE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Volatiles, as JP-4
P-B-HA-1		1.5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	9.2	1500
P-B-HA-1	F	1.5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	8.3	1500
P-B-HA-2		1.5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	3400
P-B-HA-3		1.5	24	<10	<10	<0.5	<0.5	<2.0	24	<2.0	<5.0	4200
P-B-HA-4		1.5	<10	<10	<10	1.2	0.59	<2.0	<2.0	<2.0	<5.0	1000
P-B-HA-4	L	1.5	<10	<10	<10	5.7	0.86	<2.0	<2.0	<2.0	<5.0	1300
P-A-SB-1		3-5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	79
P-A-SB-1		8-10	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	58
P-A-SB-1	F	8-10	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	76
P-A-SB-2		3-5	<10	<10	<10	<0.5	<0.5	<2.0	40	<2.0	530	35000
P-A-SB-2		6.5 -8.5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	190
P-A-SB-2	L	6.5 -8.5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	90

TABLE 1. SOIL RESULTS

Soil values are expressed as ppb.

Sample I.D.		Depth , ft.	t-1,2-DCE	c-1,2-DCE	1,2-DCA	TCE	PCE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Volatiles, as JP-4
P-7-SB-1		1-3	<10	<10	<10	<0.5	<0.5	<2.0	100	<2.0	240	21000
P-7-SB-1		3-5	<10	<10	<10	<0.5	<0.5	<2.0	46	<2.0	130	9000
P-7-SB-1		5-7	<10	<10	<10	<0.5	<0.5	<2.0	42	<2.0	88	8400
P-7-SB-1		9-11	<10	<10	<10	<0.5	<0.5	<2.0	4.2	<2.0	11	2300
P-7-SB-1		11-13	<10	<10	<10	<0.5	<0.5	<2.0	7.4	<2.0	<5.0	2500
P-7-SB-2		3-5	<10	<10	<10	<0.5	<0.5	<2.0	5.9	<2.0	<5.0	1300
P-7-SB-2		6.5-8.5	<10	<10	<10	<0.5	<0.5	<2.0	6.0	<2.0	6.3	2600
P-7-SB-2	F	6.5-8.5	<10	<10	<10	<0.5	<0.5	<2.0	7.4	<2.0	26	2600
P-7-SB-3		3-5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	360
P-7-SB-3		7-9	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	480
P-7-SB-3		11-13	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	<50
P-7-SB-4		3-5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	380

TABLE 1. SOIL RESULTS

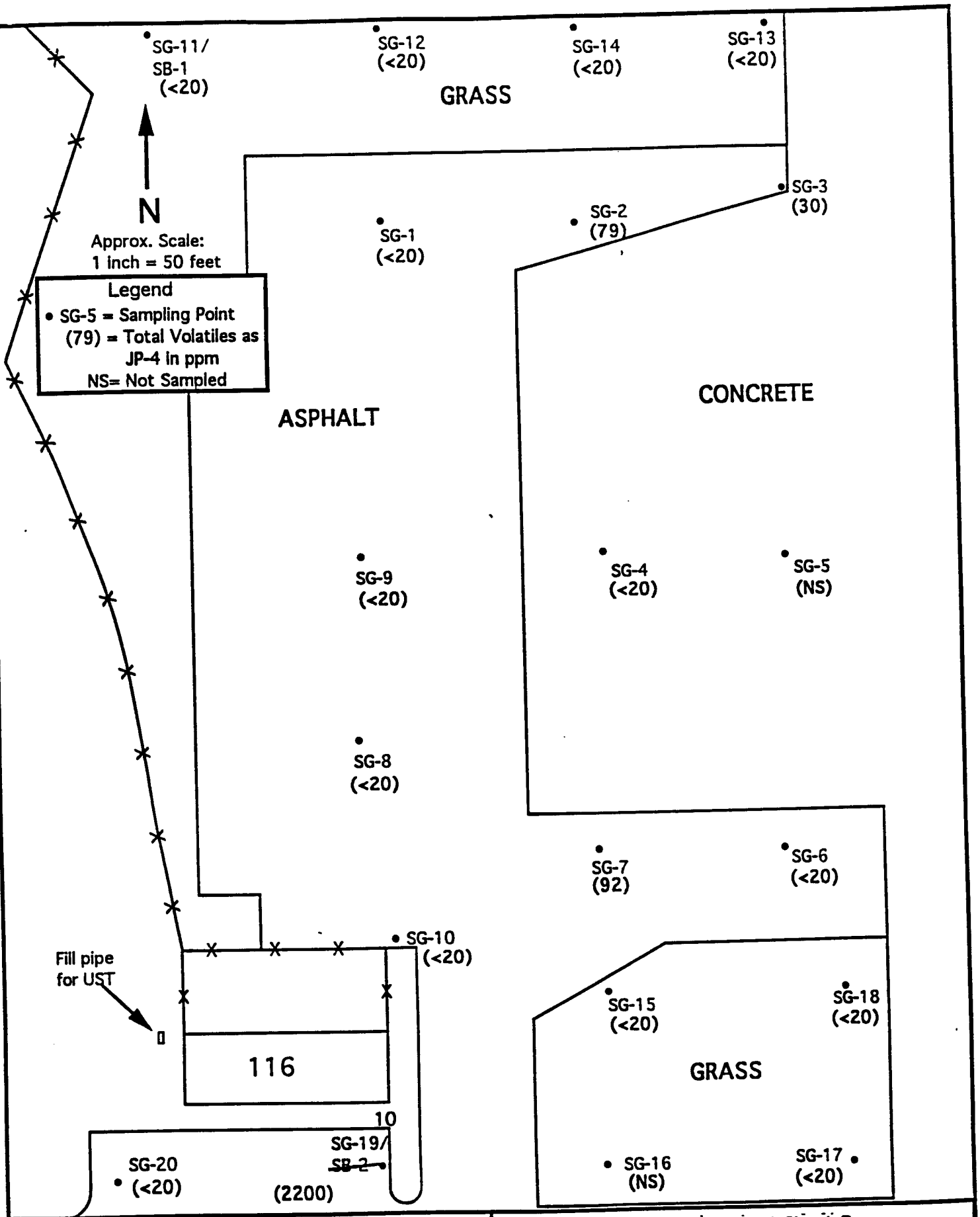
Soil values are expressed as ppb.

Sample I.D.	Depth , ft.	t-1,2-DCE	c-1,2-DCE	1,2-DCA	TCE	PCE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Volatiles, as JP-4
P-7-SB-4	7-9	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	400
P-7-SB-4	12-12.5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	490
P-7-SB-4 L	12-12.5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	540
P-7-SB-5	3-5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	1300
P-7-SB-6	3-5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	150
P-7-SB-6	7-9	<10	<10	<10	<0.5	<0.5	<2.0	4.9	<2.0	<5.0	1800
P-7-SB-6	11-13	<10	<10	<10	<0.5	<0.5	<2.0	400	<2.0	<5.0	1400
P-7-SB-7	3-5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	240
P-7-SB-7	6.5-8.5	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	360
P-7-SB-7	12-14	<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	250
Soil composite from waste barrel		<10	<10	<10	<0.5	<0.5	<2.0	7.9	<2.0	7.7	640

TABLE 1. WATER RESULTS

Water values are expressed as ppb.

Sample I.D.	Depth , ft.	t-1,2-DCE	c-1,2-DCE	1,2-DCA	TCE	PCE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Volatiles, as JP-4
Rinseate 8/29		<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	<50
Rinseate 8/30		<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	<50
Decon Water		<10	<10	<10	<0.5	<0.5	<2.0	<2.0	<2.0	<5.0	<50



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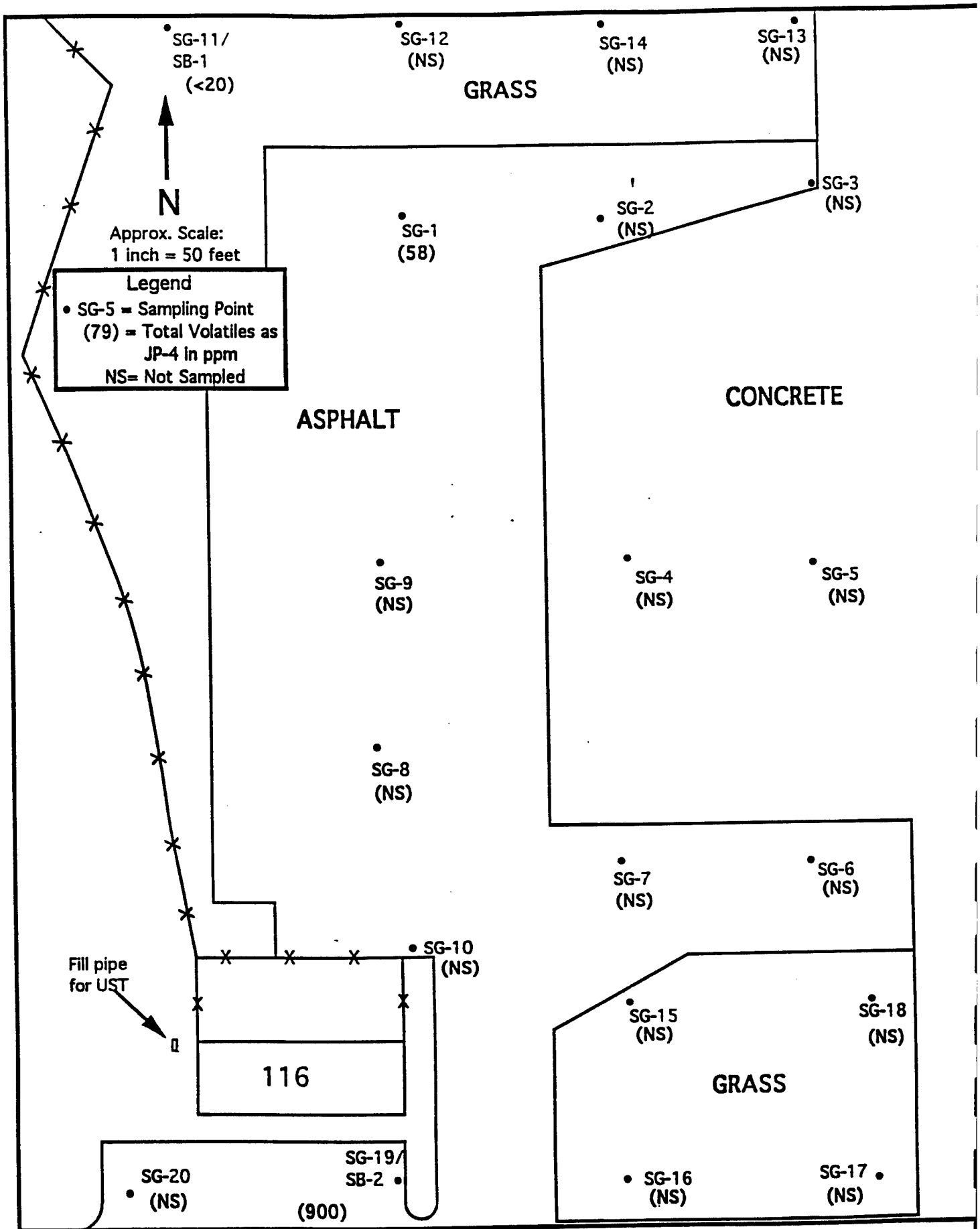
Fairfax, VA 22031

Figure 5: Pennsylvania ANG Site A Base Map with Sampling Locations (2'-5') and Soil-Gas Results (TPH)



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Fairfax, VA 22031

Figure 6: Pennsylvania ANG Site A Base Map with Sampling Locations (8.5'-10') and Soil-Gas Results (TPH)

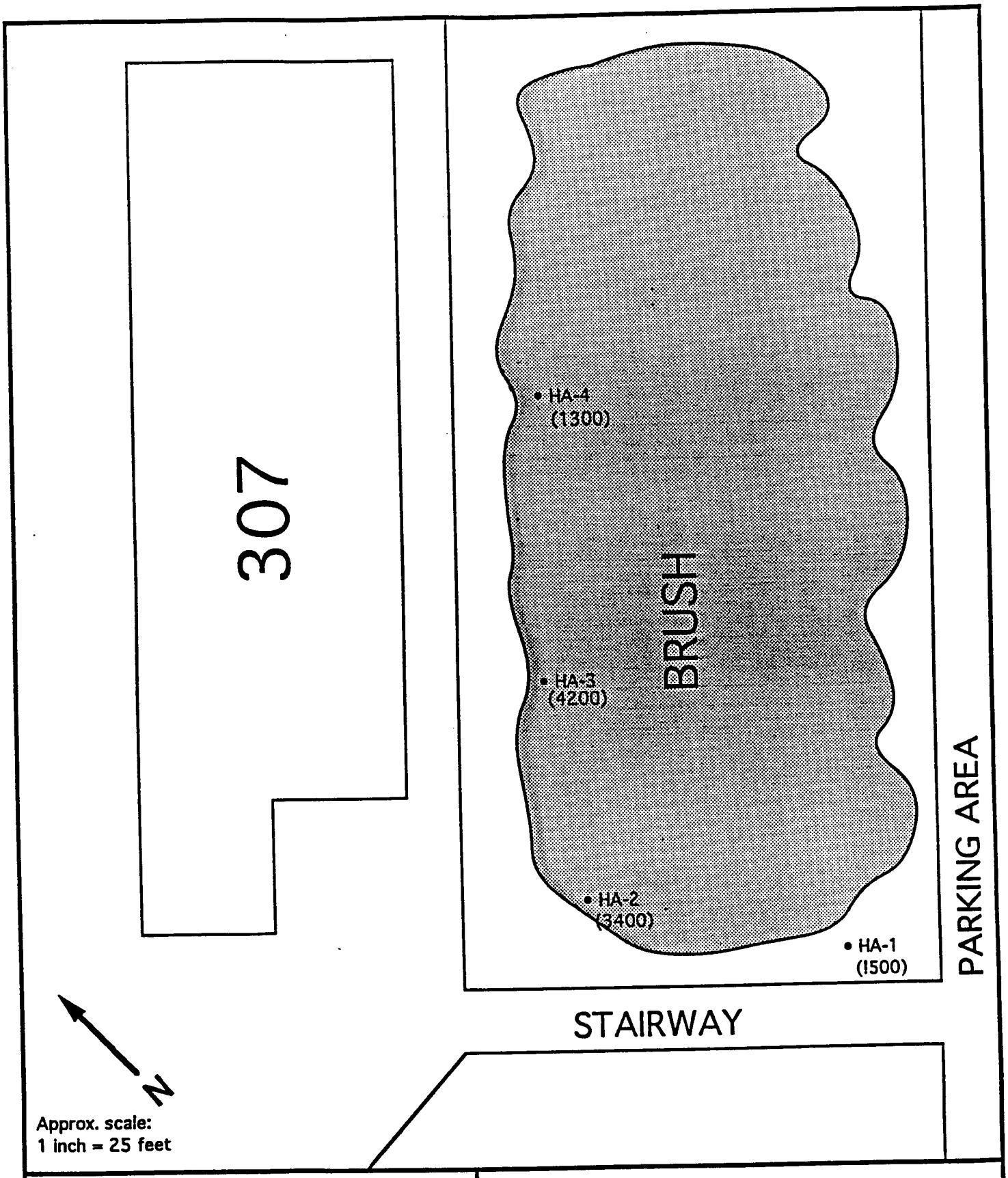

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Figure 7: Pennsylvania ANG Site B Base Map and Sampling Locations (1.5') with Soil Results (TPH)

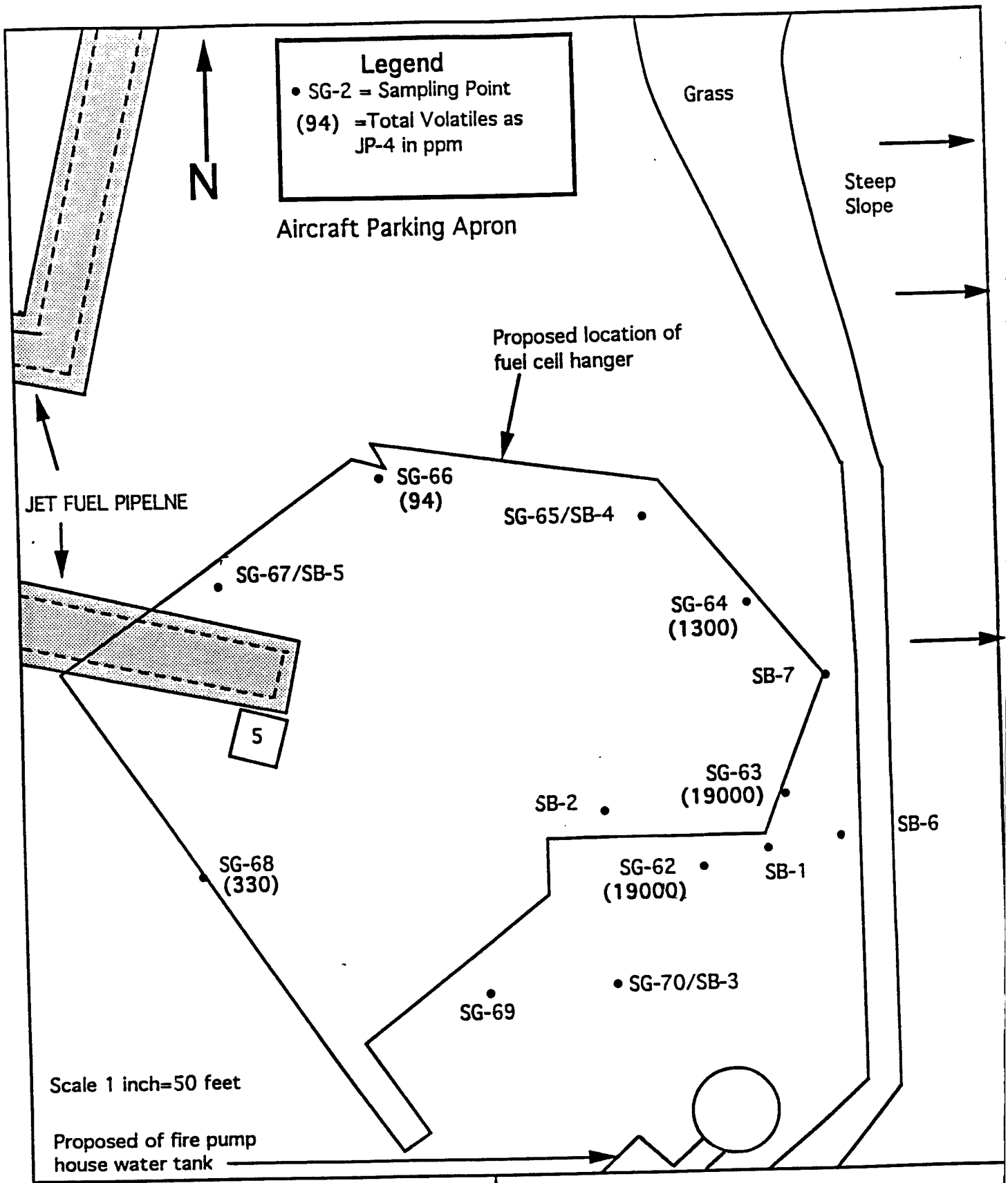

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Figure 8. Pennsylvania ANG Site 7
Soil Gas Results, 5 feet
Total Volatiles

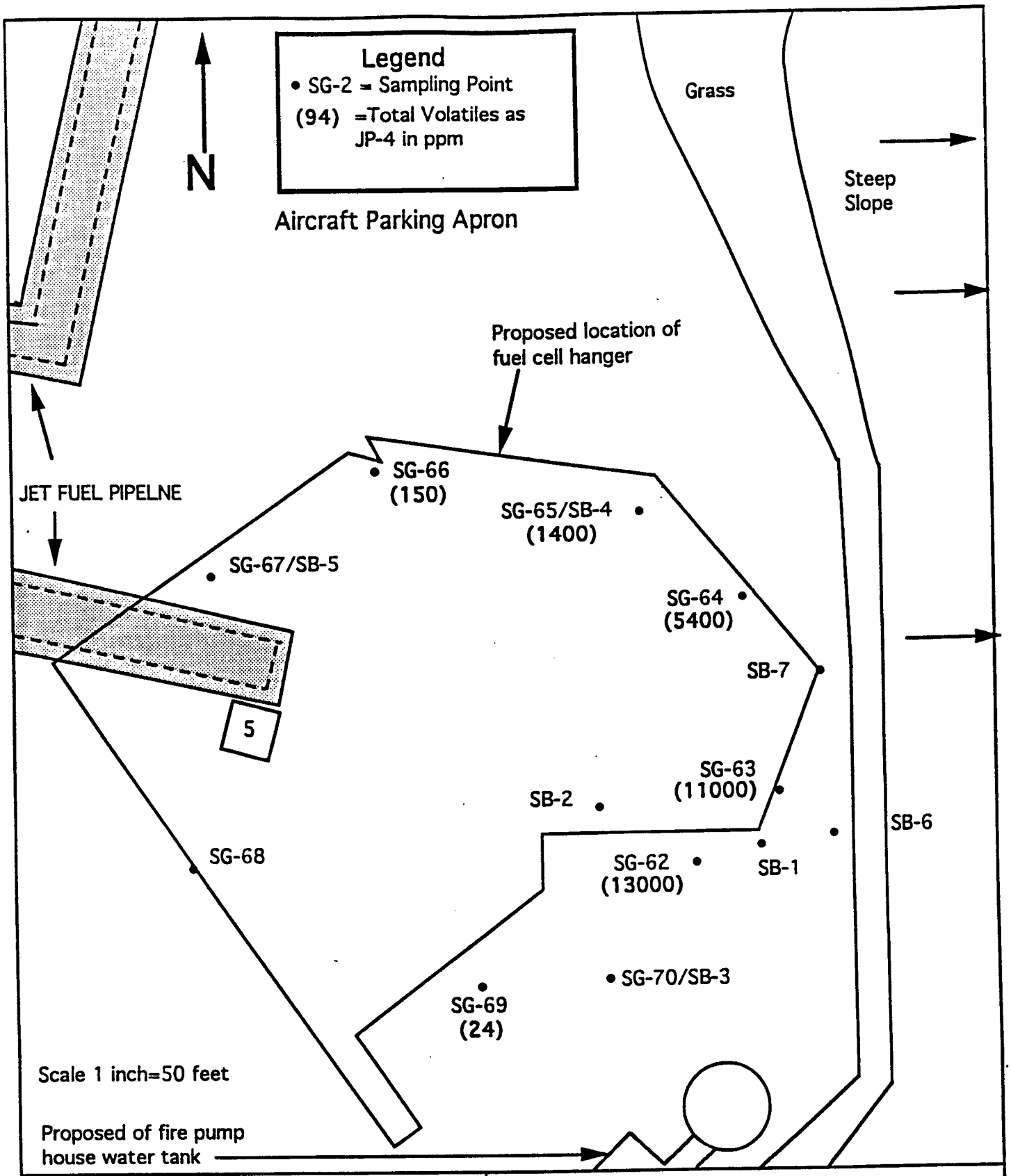

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Figure 9. Pennsylvania ANG Site 7
Soil Gas Results, 10 feet
Total Volatiles

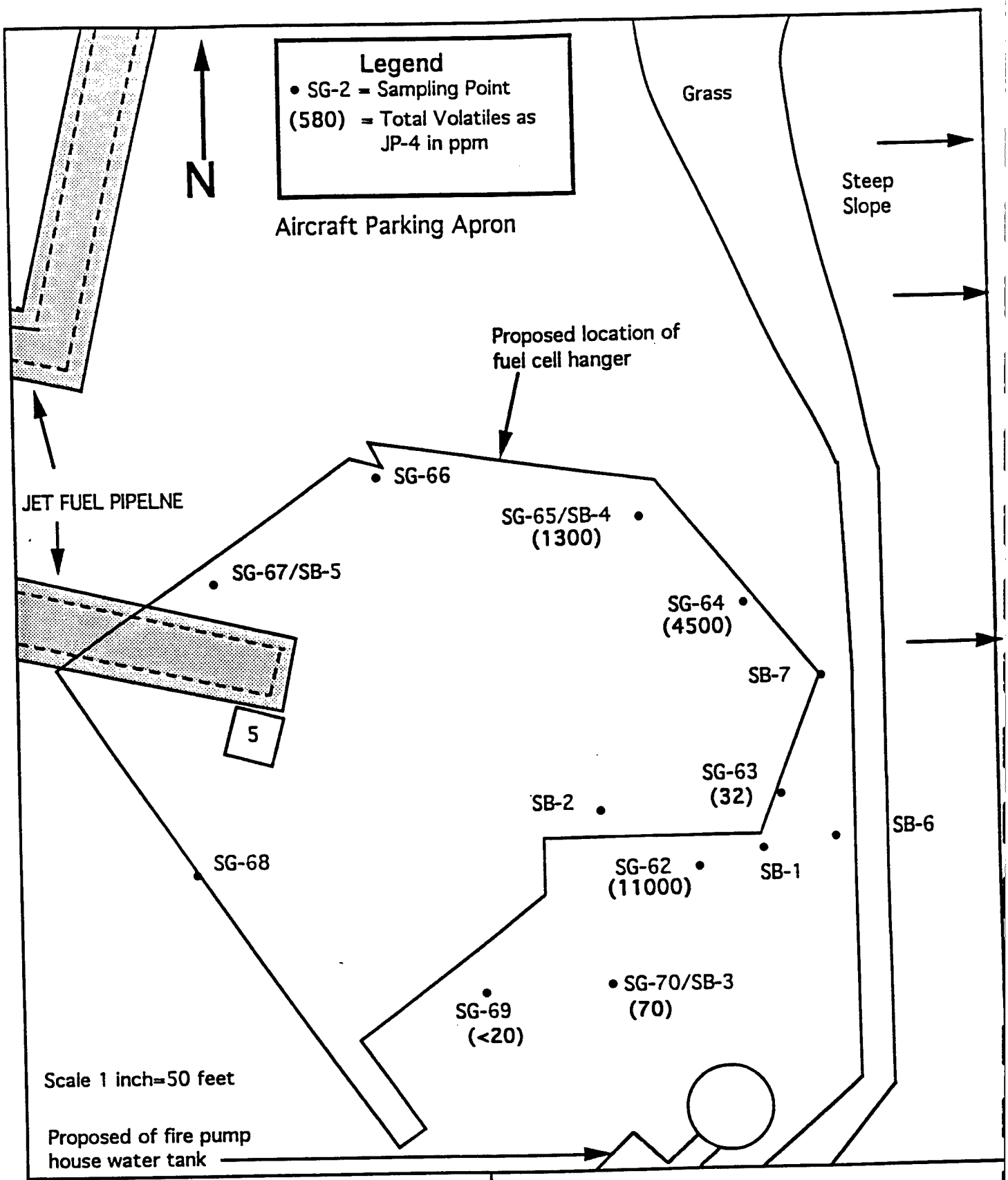

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Figure 10. Pennsylvania ANG Site 7
Soil Gas Results, 15 feet
Total Volatiles

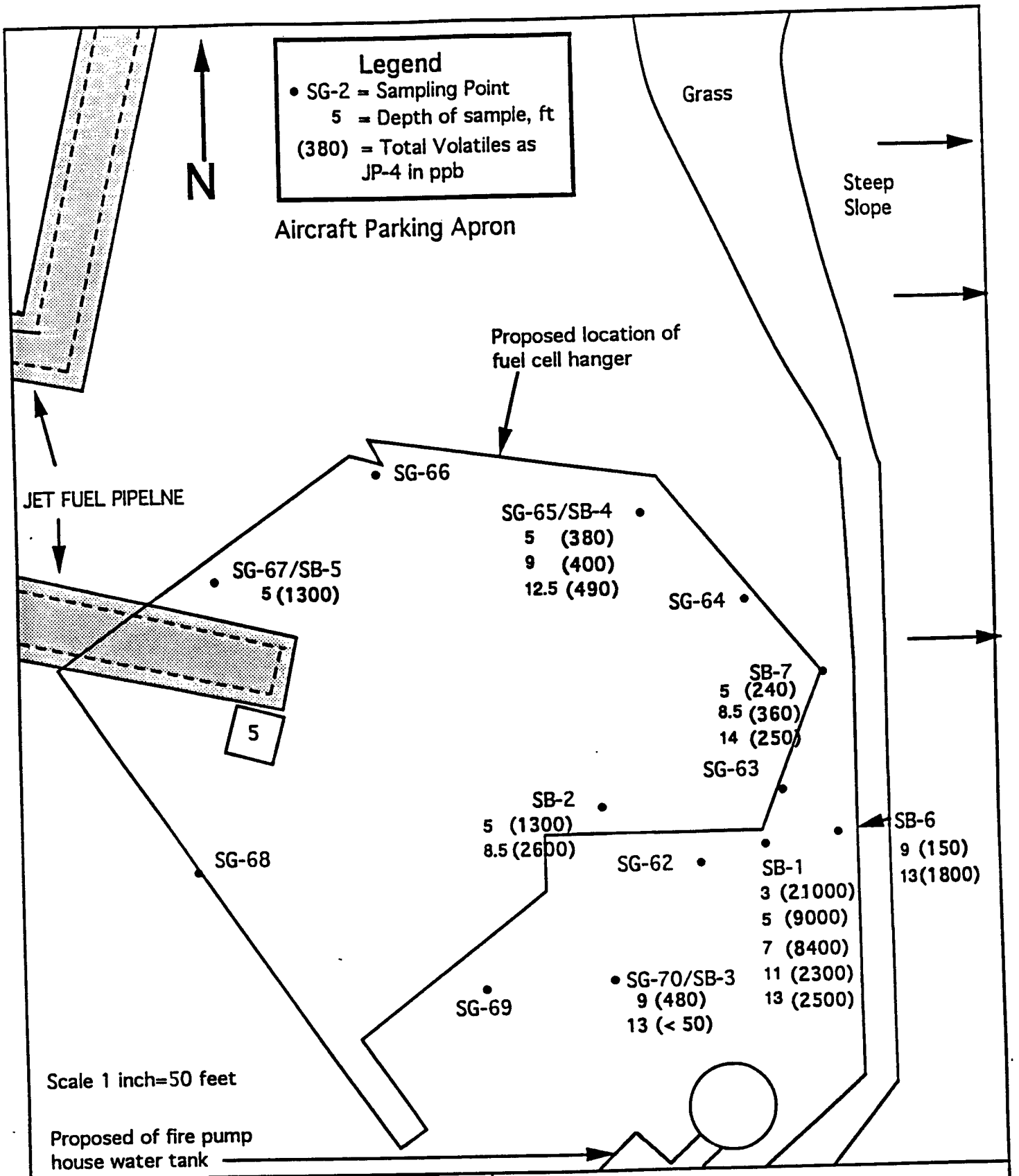

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Figure 11. Pennsylvania ANG Site 7
Soil Results, Total Volatiles

Site B No soil-gas was collected at this site, but the soil samples contained low levels of Total Volatiles contamination (see **Figure 7**). These samples were all collected near the surface (1.5 feet bgs) indicating general near surface contamination and possibly sloppy fuel handling practices.

TCE and PCE was detected at P-B-HA-4 at low ppb levels and a small amount of trans-1,2-Dichloroethene was detected at P-B-HA-3

Site 7 The soil-gas results for Site 7 show fairly extensive petroleum contamination. The Total Volatiles (as JP-4, ppm) are plotted in **Figures 8, 9, and 10** next to the sampling locations. The soil-gas depths of 5, 10, and 15 feet were plotted to show the approximate locations of results. The soil-gas results, while confirmed at several depths, do not show a pattern of areal contamination, so an attempt was not made to estimate the areal extent of contamination. The contamination appears to be the result of several spills over a period of time, or from a single significant event. No chlorinated compounds were detected at Site 7.

The soil results are plotted in **Figure 11** next to the sampling locations. The soil results tend to confirm the presence of contamination in the areas of the soil-gas "hits". The soil results appear to be at low levels in samples from Site 7. The highest level of contamination appears in samples from SB-1. The concentrations here drop significantly with depth, indicating a surface spill or pipeline leak in the area.

APPENDIX A

FIELD DATA LOG SHEETS

ENVIROSURV INC.
2800-C Dorr Avenue
Fairfax, Virginia 22031

Soil-Gas Sampling
Field Log Sheet

CLIENT: Earth Tech
LOCATION: Penn ANG

Sheet 1 of 8
Crew Chief J. Olsen
Unit No. #2
Job No. 0895011

Probe Location I.D.	PA-A-SG-1	PA-A-SG-1	PA-A-SG-2	PA-A-SG-3	PA-A-SG-4	PA-A-SG-5
Date:	8/25/95	8/25/95	8/25/95	8/25/95	8/25/95	8/25/95
Time:	2:05	2:10	2:45	3:00	4:30	4:55
Sample Number:	#1	#2	#3	#4	#5	—
Depth	4-5'	9-9.5'	1.5-2'	2-2.5'	2.5-3.0	—
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	—
Purge Volume (L.)	2L	2L	2L	2L	2L	—
Sample Vacuum (in./H2O)	9	9	9	9	9	—
Sample Volume	125ml	125ml	125ml	125ml	125ml	—
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
COMMENT	Purge time 15-20 sec.	Purge time 40-45 sec	Purge time 40-45 sec	Purge time 15-20 sec (FIELD DUP)	Purge time 15-20 sec	Refusal at 1.5'

CHAIN OF CUSTODY

Samples Relinquished By: Date N/A Time		**Lab Comments:** Samples analyzed in EnviroSurv's mobile lab.
Samples Received By: Date N/A Time		

Sample Shipment:
Hand Delivered: (yes) no
Shipped via: N/A
Date Shipped: N/A
Shipper's Signature: JEO

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Soil-Gas Sampling
Field Log Sheet

CLIENT: Earth Tech
LOCATION: Penn ANG

Sheet 2 of 8
Crew Chief J. Olsen
Unit No. #2
Job No. 08950111

Probe Location I.D.	PA-A-SG-6	PA-A-SG-7	PA-A-SG-8	PA-A-SG-9	PA-A-SG-10	PA-A-SG-11
Date:	8/25/95	8/26/95	8/26/95	8/26/95	8/26/95	8/26/95
Time:	5:11	8:30	8:40	9:04	9:26	10:00
Sample Number:	#6	#7	#8	#9	#10	#11
Depth	2.5-3.0'	4.5-5.0	3.0-3.5	3-4'	4-5'	4-5'
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	15
Purge Volume (L.)	2L	2L	2L	2L	2L	2L
Sample Vacuum (in./H2O)	9	9	9	9	9	9
Sample Volume	125ml	125ml	125ml	125ml	125	125ml
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
COMMENT	Purge time 15-20 sec	Purge time 15-20 sec	Purge time 30-35 sec	Purge time 40-45 sec	Purge time 15-20 sec	Purge time 15-20 sec

CHAIN OF CUSTODY

Samples Relinquished By: Date N/A Time		**Lab Comments:** Samples analyzed in EnviroSurv's mobile lab
Samples Received By: Date N/A Time		

Sample Shipment:
Hand Delivered: yes no
Shipped via: N/A
Date Shipped: N/A
Shipper's Signature: JEO

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Soil-Gas Sampling
Field Log Sheet

CLIENT: Earth Tech
LOCATION: Penn ANG

Sheet 3 of 8
Crew Chief J. Olsen
Unit No. #2
Job No. 087501.1

Probe Location I.D.	PA-A-SG-11	PA-A-SG-12	PA-A-SG-13	PA-A-SG-14	PA-A-SG-15	PA-A-SG-16
Date:	8/26/95	8/26/95	8/26/95	8/26/95	8/26/95	8/26/95
Time:	10:21	10:40	10:50	11:09	1:55	2:26
Sample Number:	#12	#13	#14	#15	#16	[redacted]
Depth	9-10'	4-5'	2.5-3'	3-4'	4-5'	4-5'
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	15
Purge Volume (L.)	2L	2L	2L	2L	2L	2L
Sample Vacuum (in./H2O)	9	9	9	9	9	9
Sample Volume	125ml	125ml	125ml	125ml	125ml	125ml
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
COMMENT	Purge time 15-20 sec	Purge time 1 min 30 sec	Purge time 15-20 sec	Purge time 15-20 sec <FIELD DUP>	Purge time 15-20 sec	No sample collected Right soil - purge time too long

CHAIN OF CUSTODY

Samples Relinquished By: Date N/A Time		**Lab Comments:** Sample analyzed in EnviroSurv's mobile lab
Samples Received By: Date N/A Time		

Sample Shipment:
Hand Delivered: yes no
Shipped via: N/A
Date Shipped:
Shipper's Signature: JEO

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Soil-Gas Sampling
Field Log Sheet

CLIENT: Earth Tech
LOCATION: Penn ANG

Sheet 5 of 8
Crew Chief J. Olsen
Unit No. #2
Job No. 0895011

Probe Location I.D.	PA-7-5662	PA-7-5062	PA-7-5663	PA-7-5063	PA-7-5663	PA-7-5063
Date:	8/27/95	8/27/95	8/27/95	8/27/95	8/27/95	8/27/95
Time:	8:50	9:05	9:40	9:50	10:00	12:30
Sample Number:	#23	#24	#25	#26	#27	#28
Depth	9-10'	14-15'	4-5'	9-10'	14-15'	4-5'
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	15
Purge Volume (L.)	2L	2L	2L	2L	2L	2L
Sample Vacuum (in./H2O)	9	9	9	9	9	9
Sample Volume	125ml	125ml	125ml	125ml	125ml	125ml
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
COMMENT	Purge time 15-20 sec	Purge time 15-20 sec	Purge time 1 min 30 sec	Purge time 15-20 sec	Purge time 40-45 sec	Purge time 30-35 sec

CHAIN OF CUSTODY

Samples Relinquished By:	**Lab Comments:** Samples analyzed in EnviroSurv's mobile lab
Date N/A	
Time	
Samples Received By:	**Sample Shipment:**
Date N/A	Hand Delivered: (yes) no
Time	Shipped via: N/A
	Date Shipped:
	Shipper's Signature:

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Soil-Gas Sampling
Field Log Sheet

CLIENT: Earth Tech
LOCATION: Penn ANG

Sheet 6 of 8
Crew Chief J. Olsen
Unit No. #2
Job No. 0895011

Probe Location I.D.	PA-7-SG64	PA-7-SG69	PA-7-SG64	PA-7-SG65	PA-7-SG65	PA-7-SG65
Date:	8/27/95	8/27/95	8/27/95	8/27/95	8/27/95	8/27/95
Time:	12:40	12:50	1:00	1:15	1:25	3:10
Sample Number:	#29	#30	#31	[redacted]	#32	#33
Depth	9-10'	14-15'	13.5'-18'	4-5'	9-10'	14-15'
Purge Vacuum (in./Hg-H20)	15	15	15	15	15	15
Purge Volume (L.)	2L	2L	2L	2L	2L	2L
Sample Vacuum (in./H2O)	9	9	9	9	9	9
Sample Volume	125ml	125ml	125ml	125ml	125ml	125
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
COMMENT	Purge time 15-20sec.	Purge time 40-45sec	Purge time 1min 45 sec.	Tight soils Long purge time NO SAMPLE	Purge time 15-20sec	BLIND DUP 2 Purge time 15-20sec

CHAIN OF CUSTODY

Samples Relinquished By: Date N/A Time		**Lab Comments:** Samples analyzed in EnviroSurv's mobile lab
Samples Received By: Date N/A Time		

Sample Shipment:
Hand Delivered: yes no
Shipped via: N/A
Date Shipped:
Shipper's Signature: TEO

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Soil-Gas Sampling
Field Log Sheet

CLIENT: Earth Tech
LOCATION: Penn ANG

Sheet 7 of 8
Crew Chief J.Olsen
Unit No. #7
Job No. 0895011

Probe Location I.D.	PA-7-5666	PA-7-5666a	PA-7-5667	PA-7-5668	PA-7-5669	PA-7-5669
Date:	8/27/95	8/27/95	8/27/95	8/27/95	8/27/95	8/27/95
Time:	3:30	3:40	4:11	4:33	4:45	4:55
Sample Number:	#34	#35	[redacted]	#36	[redacted]	#37
Depth	4-5'	8-9'	4-5'	4-5'	4-5'	9-10'
Purge Vacuum (in./Hg-H20)	15	15	—	15	15	15
Purge Volume (L.)	2L	2L	—	2L	2L	2L
Sample Vacuum (in./H2O)	9	9	—	9	9	9
Sample Volume	125ml	125ml	—	125ml	125ml	125ml
Sample Taken By:	J.Olsen	J.Olsen	J.Olsen	J.Olsen	J.Olsen	J.Olsen
COMMENT	Purge time 40-45sec	Purge time 30-35sec	No Sample Tight soils - rods bent	Purge time - 15-20 sec.	No Sample Tight soils	Purge time 15-20 sec.

CHAIN OF CUSTODY

Samples Relinquished By: Date N/A Time		**Lab Comments:** Samples analyzed in EnviroSurv's mobile lab
Samples Received By: Date N/A Time		

Sample Shipment:
Hand Delivered: (yes) no
Shipped via: N/A
Date Shipped: N/A
Shipper's Signature: JEO

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Soil-Gas Sampling
Field Log Sheet

CLIENT: Earth Tech
LOCATION: Penn ANG

Sheet 8 of 8
Crew Chief J. Olsen
Unit No. #7
Job No. 0895011

Probe Location I.D.	PA-7-SG69	PA-7-SG70	PA-7-SG70	PA-7-SG70		
Date:	8/27/95	8/28/95	8/28/95	8/28/95		
Time:	5:00	9:15	9:25	10:00		
Sample Number:	#38	"	"	"		
Depth	12-13'	4-5'	9-10'	14-15'		
Purge Vacuum (in./Hg-H20)	15	15	15	15		
Purge Volume (L.)	2L	2L	2L	2L		
Sample Vacuum (in./H2O)	9	9	9	9		
Sample Volume	125ml	125ml	125ml	125ml		
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen		
COMMENT	Purge time 15-20 sec.	NO SAMPLE Slow purge time	NO SAMPLE Slow purge time	Purge time 15-20 sec. <FIELD DUP>		

CHAIN OF CUSTODY

Samples Relinquished By: Date N/A Time		**Lab Comments:** Samples analyzed in EnviroSurv's mobile lab	**Sample Shipment:** Hand Delivered: yes no Shipped via: Date Shipped: Shipper's Signature:
Samples Received By: Date N/A Time			

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Subsurface Soil Sampling
Field Log Sheet

CLIENT: Earth Tech
LOCATION: Penn ANG

Sheet 1 of 4
Crew Chief J. Olsen
Unit No. #2
Job No. 08950115

Probe Location I.D.	P.B-HA1	P.B-HA2	P.B-HA3	PB-HA4	PA-7-SB1	PA-7-SB1
Date:	8/28/95	8/28/95	8/28/95	8/28/95	8/29/95	8/29/95
Time:	11:45	11:50	12:05	12:15	9:18	9:23
Sample Number:	#39	#40	#41	#42	#43	#44
Depth (top of sample):	0-6'	0-6'	0-6'	0-6'	1-3'	3-5'
Estimated Sample Volume:	Hand auger	HA	HA	HA	200gms	200gms
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
Sample Description						
COMMENTS	Surface soil sample - silt + clay loam	Surface soil sample - silt + clay loam (FIELD DUP)	Surface soil sample - silt + clay loam	Surface soil sample - silt + clay loam	Wet macadam 0-2" + compacted silt + sand 2-4" + Green Gray green clay 4-8"	+ Gray green clay silt + gravel 0-18" + moist @ 6-18"

CHAIN OF CUSTODY

Samples Relinquished By: N/A Date Time		Lab Comments: Samples analyzed in EnviroSurv's mobile lab Splits sent to fixed lab
Samples Received By: N/A Date Time		Sample Shipment: Hand Delivered (yes) no Shipped via: N/A Date Shipped: Shipper's Signature: JEO

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Subsurface Soil Sampling
Field Log Sheet

CLIENT: Earth Tech
LOCATION: Penn ANG

Sheet 2 of 3
Crew Chief J. Olsen
Unit No. #2
Job No. 0895011

Probe Location I.D.	PA-7-SB-1	PA-7-SB1	PA-7-SB1	PA-7-SB1	PA-7-SB2	PA-7-SB2
Date:	8/29/95	8/29/95	8/29/95	8/29/95	8/29/95	8/29/95
Time:	9:28	9:35	9:55	11:15	11:40	11:50
Sample Number:	#45	[illegible]	#47	#48	#49	#50
Depth (top of sample):	5-7'	7-9'	9-11'	11-13'	3-5'	6.5-8.5'
Estimated Sample Volume:	200gms	200gms	200gms	200gms	200gms	200gms
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
Sample Description						
COMMENTS	+ Gray green silty clay w/ rock fragments 0-12"	+ Gray "crumbly" consolidated silt + sand 0-10" NO SAMPLE	+ Interlayered gray green silty clay + rock fragments 0-18"	+ Gray rock fragments 0-6" + Tan brown silty clay 6-12"	+ silty clay 0-6" + clay, silt + Gravel 6-18"	+ silty clay 0-6" + clay, silt + gravel 6-18" <FIELD DUP>

CHAIN OF CUSTODY

Samples Relinquished By: Date N/A Time		**Lab Comments:** Samples analyzed in EnviroSurv's mobile lab. Soils sent to
Samples Received By: Date N/A		

Sample Shipment:
Hand Delivered: yes no
Shipped via: N/A
Date Shipped:
Shipper's Signature:

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Subsurface Soil Sampling Field Log Sheet

CLIENT: Earth Tech
LOCATION: Penn ANG

Sheet 3 of 5
Crew Chief J. Olsen
Unit No. #2
Job No. 0895011

Probe Location I.D.	PA-7-SB3	PA-7-SB3	PA-7-SB3	PA-7-SB-4	PA-7-SB-4	PA-7-SB4
Date:	8/29/95	8/29/95	8/29/95	8/29/95	8/29/95	8/29/95
Time:	1:55	2:10	2:25	2:55	3:10	3:25
Sample Number:	#51	#52	#53	#54	#55	#56
Depth (top of sample):	3-5'	7-9'	11-13'	3-5'	7-9'	12-12.5'
Estimated Sample Volume:	200gms	200 gms	400gms	200gms	200gms	200gms
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
Sample Description	0-24"		0-15"			
COMMENTS	Gray green clay w/ some silt	Gray green clay w/ some silt 0-24"	Brown silt w/ some clay 0-15" Gray green silt w/ some clay 15-24"	Gray green silty clay w/ some gravel 0-12"	Gray green silt + gravel 0-12"	Gray green silt w/ gravel Refusal at 12.5'

CHAIN OF CUSTODY

Samples Relinquished By:
Date N/A
Time

Samples Received By:
Date N/A
Time

Lab Comments:
Samples analyzed in EnviroSurv's mobile lab. Splits sent to hired lab

Sample Shipment:
Hand Delivered: yes no
Shipped via: N/A
Date Shipped:
Shipper's Signature:

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Subsurface Soil Sampling
Field Log Sheet

CLIENT: Earth Tech
LOCATION: Penn ANG

Sheet 4 of 5
Crew Chief J. Olsen
Unit No. #2
Job No. 0895011

Probe Location I.D.	PA-7-SB-5	PA-A-SB1	PA-A-SB1	PA-A-SB2	PA-A-SB2	PA-7-SB6
Date:	8/29/95	8/29/95	8/29/95	8/29/95	8/29/95	8/30/95
Time:	4:25	5:21	5:30	6:00	6:10	9:00
Sample Number:	#57	#58	#59	#60	#61	#62
Depth (top of sample):	3-5'	2-4'	8-10'	3-5'	6.5'-8.5'	3-5'
Estimated Sample Volume:	200gms	400gms	400gms	400gms	400gms	200gms
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
Sample Description		colocated w/SG-11	colocated w/SG-11	colocated w/SG-19	colocated w/SG-19	
COMMENTS	- Gray green silty clay 0-12"	- Yellow brown silt + fg gravel 0-24"	- Yellow brown silt + gravel w/ some rock fragments. 0-24" <FIELD DUP>	- Green tan silt 0-24"	- Dark brown sand + silt w/ rock fragments 0-24"	- Green gray silt + gravel 0-12"

CHAIN OF CUSTODY

Samples Relinquished By:
Date
Time N/A

Samples Received By:
Date N/A

Lab Comments: Samples analyzed in EnviroSurv's mobile lab. Splits sent to fixed lab

Sample Shipment:
Hand Delivered: yes no
Shipped via: N/A
Date Shipped:
Shipper's Signature: JEO

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Subsurface Soil Sampling
Field Log Sheet

CLIENT: Earth Tech
LOCATION: Penn ANG

Sheet 5 of 5
Crew Chief J. Olsen
Unit No. #2
Job No. 0895011

Probe Location I.D.	PA-7-SB6	PA-7-SB6	PA-7-SB6	PA-7-SB6	PA-7-SB6
Date:	8/30/95	8/30/95	8/30/95	8/30/95	8/30/95
Time:	9:30	9:55	10:17	10:20	10:30
Sample Number:	#63	#64	#65	#66	#67
Depth (top of sample):	6.5-8.5'	12-14'	2-3.5'	7-9'	11-13'
Estimated Sample Volume:	200gms	200gms	200gms	200gms	200gms
Sample Taken By:	J. Olsen	J. Olsen	J. Olsen	J. Olsen	J. Olsen
Sample Description					
COMMENTS	Gray green silt w/ some rock fragments 0-12"	Gray green silt w/some rock fragments + some clay @ 12"	Gray green silt + gravel	Gray green silt + gravel	Brown silt + gravel 0-8" Gray rock fragments 8-18" Refusal at 13'

CHAIN OF CUSTODY

Samples Relinquished By: Date N/A Time		Lab Comments: Samples analyzed in EnviroSurv's mobile lab. Splits sent to fixed lab
Samples Received By: Date N/A		Sample Shipment: Hand Delivered: (yes) no Shipped via: N/A Date Shipped: N/A Shipper's Signature: JEA

Appendix E: Quality Assurance/Quality Control Evaluation

E.1 INTRODUCTION

A standardized Quality Assurance/Quality Control (QA/QC) program was followed during the Site Investigation (SI) at the 171st Air Refueling Wing, Pennsylvania Air National Guard (ANG), Coraopolis, Pennsylvania to ensure that analytical results accurately represent the environmental conditions at the sites. The SI field activities were conducted using the Hazardous Waste Remedial Actions Program (HAZWRAP) Level C (i.e., U.S. Environmental Protection Agency (EPA) Level III) QC requirements described in *Requirements For Quality Control of Analytical Data* (HAZWRAP, July 1990b) and the guidelines and specifications described in the SI Work Plan. The data validation was completed using the guidelines in the HAZWRAP guidance document *Requirements for Quality Control of Analytical Data* revised in 1995 (HAZWRAP, 1995).

Twenty-seven environmental soil, 6 environmental sediment samples, 3 duplicate soil samples, 1 duplicate sediment sample, 4 equipment rinseates (ERs), 4 field blanks (FBs), and 4 trip blanks (TBs) were submitted for laboratory analyses. Samples collected at Site 7 were analyzed for benzene, toluene, ethylbenzene, xylenes (BTEX) and total petroleum hydrocarbons (TPH). Samples collected at Site 7 were validated to Level C standards. TBs were analyzed only for BTEX. A summary of the analyses performed is presented in Table E-1.

Table E-1 Summary of Analytical Program
171st Air Refueling Wing
Pennsylvania ANG, Coraopolis, Pennsylvania

Sample	BTEX[1]	TPH[2]
Site 7		
Soil	27	27
Sediment	6	6
Field Duplicates	4	4
Equipment Rinseates	4	4
Field Blanks	4	4
Trip Blanks	4	-

Notes:
1. Samples for benzene, toluene, ethylbenzene, and xylene (BTEX) analyzed using SW-846 Method 8240.
2. Samples for Total Petroleum Hydrocarbons (TPH) analyzed using SW-846 Method 8015

E.2 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative statements developed by data users to specify the quality of data obtained from field and laboratory data collection activities to support specific decisions or regulatory actions. DQOs also establish numeric limits for the data to allow the data user to determine if the data collected are of sufficient quality for use in their intended application. The data collected during the SI field effort will be used to (1) confirm or deny the presence or absence of suspected contamination at the identified sites and (2) evaluate the human health or environmental implications. DQOs were established for precision, accuracy, representativeness, comparability, and completeness (PARCC). The DQOs for all PARCC parameters with quantitative values were set at 90%. The following sections summarize the DQOs established for the PARCC parameters and the levels of agreement obtained during the SI.

E.2.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Precision is expressed quantitatively as the measure of the variability of a group of measurements compared to their average value. The closer the numerical value of the measurements are to each other, the more precise the measurement. Precision was defined as the reproducibility, or degree of agreement, among replicate measurements of the same quantity. Precision was expressed as the percentage of the difference between results of duplicate samples for a given compound or element. Relative percent difference (RPD) was calculated as:

$$RPD = \frac{Abs(C_1 - C_2)}{\frac{C_1 + C_2}{2}} \times 100$$

Where; C_1 = Concentration of the compound or element in the sample.
C_2 = Concentration of the compound of element in the duplicate.

The RPD was then compared to established limits to determine the level of precision achieved. For this project overall precision was comprised of analytical and sampling precision. The objectives for analytical precision, sampling precision, and overall precision are to have 90% of the values calculated within the specified RPD range.

Analytical precision refers to the ability of the laboratory to reproduce measurements of a sample concentration. Analytical precision was assessed through the use of analytical replicate samples. Precision was determined using Matrix Spike/Matrix Spike Duplicates (MS/MSD) and duplicate sample analyses conducted on samples collected for BTEX and TPH analyses. The laboratory selected one sample in 20 and split the sample into two aliquots, to be used for MS/MSD analyses. MS/MSD samples were prepared by routinely screening the first aliquot for the parameters of interest before analyses, while the remaining aliquot was spiked with known quantities of parameters of interest and analyzed twice. The RPDs

between the results were calculated and used as an indication of the analytical precision for the BTEX and TPH analyses. The RPD between the two sample concentrations was calculated and used as an indication of the analytical precision for the analyses performed.

None of the four RPD values calculated from the BTEX analyses exceeded the control limit of 21% for analytical precision. One of the four RPD values calculated from the TPH analyses exceeded control limits of ±25% for TPH-extractable, ±30% for TPH-purgeable for analytical precision.

The analytical QC results do not indicate a systemic laboratory problem. Based on 88% of the calculated values meeting control limits and acceptable laboratory QC, the DQO for analytical precision has not been met.

Sampling precision refers to the ability of the sampling procedure to reproduce the conditions at the site. Sampling precision was assessed through the collection of field duplicates. Duplicate samples were collected at a rate of one in 20 and submitted with the environmental samples for BTEX and TPH analyses. RPD values were calculated for all compounds and elements. The RPDs were then used to measure the sampling precision. One sediment and four soil duplicates were collected during the SI field effort. The duplicate samples were collected using the same procedures used to collect the environmental samples. The overall project objective for sampling precision outlined in the Sampling and Analysis Plan is to have 90% of the values calculated for the sampling program within the specified RPD range of ± 35% for soil samples. Based on the RPD values calculated, 18 of the 21 RPD values calculated, met the associated RPD criteria. This represents a sampling precision of 86%. As a result, the DQO for analytical precision has not been met. A complete discussion of all duplicate samples is presented in Section E.3.

Based on the results of the laboratory and sampling precision, 25 of 29 RPD values met the associated RPD criteria. These results represent an overall precision of 86%. As a result, the DQO for overall precision has not been met. No corrective action was required based on the RPD values.

E.2.2 ACCURACY

Accuracy measures the bias in a measurement system. Accuracy was defined as the degree of difference between measured or calculated values and the true value. The closer the numerical value of the measurement approaches the true value, or actual concentration, the more accurate the measurement. Overall project accuracy consists of both analytical and sampling accuracy.

Analytical accuracy is expressed as the percent recovery (%R) of a compound or element that has been added to the environmental sample at a known concentration before analysis. Analytical accuracy was determined using MS/MSD and surrogate recovery data. The following equation was used to calculate %R:

$$\%R = \frac{A_r - A_0}{A_f} \times 100$$

Where: A_r = Analyte concentration detected in the spiked sample
A_0 = Analyte concentration detected in the unspiked sample
A_f = Analyte concentration added to the sample

Objectives for accuracy were to have 90% of the data within the specified recovery levels for that compound or element. Analytical accuracy was qualitatively assessed by evaluating the following laboratory QC information: sample holding times, method blanks, tuning and mass calibrations gas chromatography/mass spectroscopy (GC/MS only), internal standards (GC/MS only), laboratory control samples, method blank spike recoveries, and initial and continuing calibration results calculated from all analyses conducted on environmental samples. Analytical accuracy was quantitatively assessed by evaluating the %R of spikes and surrogates.

Percent Recoveries

None of the 8 percent recoveries were outside the control limits for the MS/MSD analyses conducted on the samples collected and analyzed for BTEX. The control limit for benzene is 66-142% and 59-139% for Toluene. None of the 24 surrogate %Rs were outside the control limits for surrogate analyses. All supporting BTEX QC information cited above was also qualitatively evaluated with respect to the analytical accuracy DQOs.

Three of the eight %R values for MS/MSD values obtained for TPH analyses were outside control limits of 50-150 %R for TPH-extractable and 70-130 %R for TPH-purgeable. None of the 27 %R values were outside the control limits for the surrogate analyses conducted on the samples collected and analyzed for TPH. All supporting TPH QA information cited above also were qualitatively evaluated with respect to the analytical accuracy DQO. All other QC criteria for TPH analyses were met.

A total of three of the 67 %R values exceeded control limits indicating that 96% accuracy was achieved. As a result of 96% of all %Rs meeting control limits, the DQO for analytical accuracy has been met.

Sampling accuracy was maximized by adherence to the strict QA program presented in the SI Quality Assurance Project Plan (QAPP). All procedures (i.e., soil boring installation, soil samples collection procedures, and health monitoring equipment calibration and operation) used during the SI were documented as standard operating procedures (SOPs). Field QA samples (i.e., TBs, FBs, and ERs) were prepared such that all samples represented the particular site from which they were collected, and assessed any cross-contamination that may have occurred. The environmental samples associated with the appropriate field QA samples were qualified based on the contaminants detected in the field QA samples. Compounds detected in associated environmental samples with concentrations less than five times (ten times for common laboratory contaminants) that detected in the blank were considered estimates and were qualified "B".

Based on an evaluation of the compounds detected in the field QC blanks, overall field accuracy is deemed acceptable, except where noted. A complete discussion of field QC results is presented in Section E.3.

E.2.3 Representativeness

Representativeness expresses the degree to which the data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Sample representativeness was ensured, during the SI, by collecting sufficient samples of a population medium, properly distributed with respect to location and time. Representativeness was assessed by reviewing the drilling and sample collection methods used during the SI at the base. The reproducibility of a representative set of samples reflects the degree of heterogeneity of the sampled medium, as well as the effectiveness of the sampling techniques.

Soil samples were collected from Site 7 and submitted for laboratory analyses. All soil samples were collected from borings. All borings were advanced using direct push technology using stainless steel rods equipped with removable stainless steel liners. Samples were logged according to the Unified Soils Classification System and field-screened with a photo ionization detector (PID) meter and field GC for Volatile Organic Compound concentrations. All borings were backfilled with a granular bentonite to the surface. All borings were marked at the surface and surveyed. A minimum of two soil samples, from each boring, were submitted for laboratory analyses. The sample collected from just below the ground surface and the sample collected from just above the perceived depth of bedrock were submitted for laboratory analyses. A third sample was sometimes submitted based on PID results and/or lithology.

Based on the evaluation of the factors described above and summarized in Section E.3 the samples collected during the SI are considered to be representative of the environmental conditions at the base.

E.2.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another and is limited to the other PARCC parameters, because only when precision and accuracy are known can one data set be compared to another. To optimize comparability, only the specific methods and protocols that were specified in the SI QAPP were used to collect and analyze samples during the SI. By using consistent sampling and analysis procedures, all data sets are comparable within the two sites at the base, between the two sites, or among ANG facilities nationwide. This consistency ensures that remedial action decision and priorities are based on a consistent data base.

All samples collected for BTEX and TPH analyses were analyzed using EPA SW-846 Methods 8240 and 8015, respectively.

Based on the precision and accuracy assessment presented above, the data collected during the SI are considered to be comparable with the data collected during previous investigations.

E.2.5 Completeness

Completeness was defined as the percentage of usable data obtained from a measurement system. Usable data are those data not rejected during the data validation process. Values and concentrations qualified "R" or "B" are excluded from use in the SI report due to increased risk of indicating false positives or omitting compounds or elements that are present. Project completeness was defined as the percentage of data points used to prepare the risk characterization and recommendations for site remediation. The objective for project completeness was set at 90%.

Based on the evaluation of the laboratory QC results for the 194 data points presented in Appendix F, these data were considered equal to 89% complete, and as such, were used as the basis of all recommendations presented in this report. A total of 22 data points were rejected from use because the data were qualified "B" indicating possible contamination from an outside source. No data were qualified "R".

E.3 FIELD QUALITY CONTROL ASSESSMENT

In an effort to assess field QC, field QC samples were collected. These samples include four TBs, four FBs, four ERs, and four field duplicate samples. The number of field QC samples collected was in accordance with HAZWRAP guidance as presented in DOE/HWP-69/R2. All field QC samples were collected and analyzed by the same SOPs and methods used for the 39 environmental samples. Table E-2 contains a cross-reference of the associated field QC blanks.

Trip Blanks

TBs were used to check for cross-contamination during handling and shipping of samples to be analyzed for BTEX. Trip blanks were supplied by Compuchem and Inchcape Laboratories. Trip blanks were prepared using American Society of Testing and Materials (ASTM) Type II water. The TBs were stored with unused sample bottles, placed in the appropriate cooler before sampling, and returned to the laboratory with each cooler containing samples to be analyzed for BTEX. A total of four TBs were shipped with samples and analyzed for BTEX. No BTEX compounds were detected in the TBs.

Field Blanks

FBs were collected to provide baseline analytical data for the water used for equipment decontamination. Four FBs were collected during each round of sampling, including blanks for the ASTM Type II water and the potable water used in the steam cleaner and as decontamination water. FBs were collected by randomly selecting sample containers, filling them with water from the sample source, and then preserving as appropriate for the required analysis. The blanks were analyzed for BTEX and TPH in the same manner as the associated

Table E-2: Field QC Cross-reference
117st Air Refueling Wing
Pennsylvania ANG, Coraopolis, Pennsylvania

Sample ID	Sample Date	Trip Blank	Field Blank	Equipment Rinseate
P-S7-B01-0406	11/15/94	P-S7-TB1-1115	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B01-0911	11/15/94	P-S7-TB1-1115	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B02-0305	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B02-0709	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B03-0001	11/17/94	P-S7-TB2-1117	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B04-0305	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B05-0305	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B06-0305	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B06-0709	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B07-0507	11/15/94	P-S7-TB1-1115	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B08-0911	11/15/94	P-S7-TB1-1115	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B09-0305	11/15/94	P-S7-TB1-1115	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B10-0305	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B11-0305	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B11-0709	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B11-0709D	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B12-0305	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B12-0305D	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B12-0709	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B13-0406	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B14-0204	11/16/94	P-S7-TB2-1116	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-B15-0305	08/29/95	P-TB2-082995	FB1-083195, FB2-083195	P-ER2-082995
P-S7-B16-0305	08/29/95	P-TB2-082995	FB1-083195, FB2-083195	P-ER2-082995
P-S7-B16-6585	08/29/95	P-TB2-082995	FB1-083195, FB2-083195	P-ER2-082995
P-S7-B17-0305	08/29/95	P-TB2-082995	FB1-083195, FB2-083195	P-ER2-082995
P-S7-B17-0709	08/29/95	P-TB2-082995	FB1-083195, FB2-083195	P-ER2-082995
P-S7-B18-0305	08/29/95	P-TB2-082995	FB1-083195, FB2-083195	P-ER2-082995
P-S7-B18-0305D	08/29/95	P-TB2-082995	FB1-083195, FB2-083195	P-ER2-082995
P-S7-B18-12125	08/29/95	P-TB2-082995	FB1-083195, FB2-083195	P-ER2-082995
P-S7-B19-0305	08/29/95	P-TB2-082995	FB1-083195, FB2-083195	P-ER2-082995
P-S7-SD01	11/17/94	P-S7-TB2-1117	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-SD01D	11/17/94	P-S7-TB2-1117	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-SD02	11/17/94	P-S7-TB2-1117	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-SD03	11/17/94	P-S7-TB2-1117	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-SD04	11/17/94	P-S7-TB2-1117	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-SD05	11/17/94	P-S7-TB2-1117	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115
P-S7-SD06	11/17/94	P-S7-TB2-1117	S7-FB1-1115,S7-FB2-1115	P-S7-EB1-1115

environmental samples. No target compounds were detected in the FBs. Field blank FB2 was not analyzed due to laboratory failure. Based on the corresponding analytical data, loss of the field blank was not considered to impact the reliability of the laboratory data.

Equipment Rinseates

ERs were collected to check for cross-contamination introduced from sample to sample through the sampling equipment. Four ERs were collected during the two rounds of sampling. All ERs were prepared by pouring ASTM Type II water through or over decontaminated sampling equipment. The ERs were preserved as appropriate for the required analysis and analyzed using the same methods as the associated environmental samples. No target compounds were detected in the ERs.

Field Duplicates

Field duplicates were used as a measure of sampling precision, samples collection reproducibility, and media variability during the SI at the base. Field RPD values were calculated for all target compounds and elements. The RPD values were reviewed to assess the sample collection reproducibility and matrix variability. A total of 27 soil samples and 1 soil replicate samples, 6 sediment and 1 sediment replicated sample were collected. The field duplicate for each soil analyses was obtained from the adjacent sleeve.

Average values for field replicates were obtained using the following guidelines;

(1) If the analyte was detected in both samples the results were averaged
(2) If the analyte was detected in one sample, and was qualified "B" or "R" in the other sample the good value, not qualified "B" or "R", was used
(3) If the analyte was detected in only one sample and the detected value was greater than 1/2 the quantitation limit, the detected value was averaged with 1/2 the quantitation limit.
(4) If the analyte was detected in only one sample and the detected value was less than 1/2 the quantitation limit, the detected value was used.

E.4 LABORATORY QUALITY CONTROL ASSESSMENT

All environmental samples collected at the Pennsylvania ANG base were analyzed using the SW-846 Statement Of Work for GC/MS analyses and EPA solid waste test methods and general chemical methodology from the following references:

- ***Test Methods for Evaluating Solid Waste, Physical/ Chemical Methods***, SW-846, Third Edition, September 1986, with 1989 revisions

- ***Requirements for Quality Control of Analytical Data***, HAZWRAP, DOE/HWP-65/R2 3/95

HAZWRAP Level C documentation was required and submitted by the laboratory for all analyses. All data were validated and qualified using the guidelines and specifications described in the following documents:

- ***Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses***, EPA Contract Laboratory Program, June 1991

- ***Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses***, EPA Contract Laboratory Program, June 1988

- ***Requirements for Quality Control of Analytical Data,*** Hazardous Waste Remedial Actions Program (DOE/HWP-65/R2), March 1995

In addition to the above guidelines, additional steps were taken to make the data validation process clearer to the data user. In the validation processes the "B" qualifier is used to indicate potential contamination from an outside source. An example of the modification of guidelines is presented for BTEX. According to DOE/HWP-65/R2, March 1995 guidelines for BTEX data validation analyzed by GC/MS, any compound detected in the sample, and in the associated blank must be qualified when the sample results is less than five times then highest concentration found in any blank. Sample results greater than the quantitation limit, but less than five times the highest concentration found in any blank should be qualified "U". If the sample result is greater than the quantitation limit and greater than five times the blank concentration no qualification is required. The rule is modified for common laboratory contaminants (methylene chloride, acetone, toluene, 2-butanone, and common phthalate esters) to require a concentration ten times the highest concentrations found in any blank. The use of the "U" qualifier in the first two cases could cause confusion as to the actual presence of the compound for results above the quantitation limit and possibly for those results below the quantitation limit. The "B" qualifier clearly indicates that the result may be suspect and may be the result of outside contamination. The use of the "B" qualifier is consistently applied to BTEX and TPH analyses. The proper application of the 5X and 10X rule is used where applicable.

In addition to the "B" qualifier, the laboratory "J" qualifier, "B" qualifier for metals, was removed from detects below the quantitation limit and was replaced with a "( )" qualifier prior to validation. The "J" qualifier is usually used to indicate QC concerns, the use of the "( )" qualifier clearly indicates results below the quantitation limit, without implying QC problems.

All data validation qualifiers used were applied to the data as required by the aforementioned guidelines. A complete summary of all data obtained and the qualifiers applied to that data are presented in Appendix F.

Appendix F: Fixed Base Laboratory Data and Validation Summary and Data

Table F-1 Site 7: Soil Data Summary Table

171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

LOCATOR:		7-B01		7-B01		7-B02		7-B02		7-B03		7-B04	
SAMPLE ID:		P-S7-B01-0406		P-S7-B01-0911		P-S7-B02-0305		P-S7-B02-0709		P-S7-B03-0001		P-S7-B04-0305	
COLLECTION DATE:		11/15/94		11/15/94		11/16/94		11/16/94		11/17/94		11/16/94	
ASSOCIATED QC:		P-S7-TB1-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB1-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1117,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Volatile Compounds by 8240													
Benzene	µg/kg	16	U	17	U	17	U	17	U	17	U	17	U
Ethylbenzene	µg/kg	16	U	17	U	17	U	17	U	17	U	17	U
Toluene	µg/kg	16	U	17	U	17	U	17	U	17	U	17	U
Xylene (total)	µg/kg	22	U	23	U	23	U	23	U	23	U	23	U
Total Petroleum Hydrocarbons by Modified 8015													
TPH-diesel	mg/kg	26		45		12	B	12	B	160		23	B
TPH-gasoline	mg/kg	-		-		-		-		-		-	

Sample IDs ending with D are duplicate samples

mg/kg milligrams/kilogram
µg/kg micrograms/kilogram

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Possible blank contamination
J Reported value is estimated
U Compound analyzed for but not detected

Table F-1 (Continued) Site 7: Soil Data Summary Table
171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

	UNITS:	LOCATOR: 7-B05 SAMPLE ID: P-S7-B05-0305 COLLECTION DATE: 11/16/94 ASSOCIATED QC: P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		LOCATOR: 7-B06 SAMPLE ID: P-S7-B06-0305 COLLECTION DATE: 11/16/94 ASSOCIATED QC: P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		LOCATOR: 7-B06 SAMPLE ID: P-S7-B06-0709 COLLECTION DATE: 11/16/94 ASSOCIATED QC: P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		LOCATOR: 7-B07 SAMPLE ID: P-S7-B07-0507 COLLECTION DATE: 11/15/94 ASSOCIATED QC: P-S7-TB1-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		LOCATOR: 7-B08 SAMPLE ID: P-S7-B08-0911 COLLECTION DATE: 11/15/94 ASSOCIATED QC: P-S7-TB1-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		LOCATOR: 7-B09 SAMPLE ID: P-S7-B09-0305 COLLECTION DATE: 11/15/94 ASSOCIATED QC: P-S7-TB1-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116	
		RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Volatile Compounds by 8240													
Benzene	µg/kg	16	U	18	U	17	U	16	U	16	U	17	U
Ethylbenzene	µg/kg	16	U	18	U	17	U	16	U	16	U	17	U
Toluene	µg/kg	16	U	18	U	17	U	16	U	16	U	17	U
Xylene (total)	µg/kg	22	U	24	U	23	U	21	U	21	U	23	U
Total Petroleum Hydrocarbons by Modified 8015													
TPH-diesel	mg/kg	12	B	11	()B	11	()B	28		51		36	
TPH-gasoline	mg/kg	-		-		-		-		-		-	

Sample IDs ending with D are duplicate samples

mg/kg milligrams/kilogram

Data Validation Qualifiers

() Result is between the detection limit and the quantitation limit

Table F-1 (Continued) Site 7: Soil Data Summary Table
171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

	LOCATOR:	7-B10		7-B11		7-B11		7-B11		7-B12		7-B12	
	SAMPLE ID:	P-S7-B10-0305		P-S7-B11-0305		P-S7-B11-0709		P-S7-B11-0709D		P-S7-B12-0305		P-S7-B12-0305D	
	COLLECTION DATE:	11/16/94		11/16/94		11/16/94		11/16/94		11/16/94		11/16/94	
	ASSOCIATED QC:	P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Volatile Compounds by 8240													
Benzene	µg/kg	16	U	18	U	16	U	16	U	17	U	17	U
Ethylbenzene	µg/kg	16	U	18	U	16	U	16	U	17	U	17	U
Toluene	µg/kg	16	U	18	U	16	U	16	U	17	U	17	U
Xylene (total)	µg/kg	21	U	24	U	22	U	21	U	23	U	23	U
Total Petroleum Hydrocarbons by Modified 8015													
TPH-diesel	mg/kg	11	B	11	()B	7.20	()B	10	()B	5.20	()B	6.20	()B
TPH-gasoline	mg/kg	-		-		-		-		-		-	

Sample IDs ending with D are duplicate samples

mg/kg milligrams/kilogram
µg/kg micrograms/kilogram

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Possible blank contamination
J Reported value is estimated
U Compound analyzed for but not detected

Table F-1 (Continued) Site 7: Soil Data Summary Table
171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

	LOCATOR:	7-B12		7-B13		7-B14		7-B15		7-B16		7-B16	
	SAMPLE ID:	P-S7-B12-0709		P-S7-B13-0406		P-S7-B14-0204		P-S7-B15-0305		P-S7-B16-0305		P-S7-B16-6585	
	COLLECTION DATE:	11/16/94		11/16/94		11/16/94		08/29/95		08/29/95		08/29/95	
	ASSOCIATED QC:	P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1116,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Volatile Compounds by 8240													
Benzene	µg/kg	17	U	17	U	16	U	5	U	5	U	6	U
Ethylbenzene	µg/kg	17	U	17	U	16	U	5	U	5	U	6	U
Toluene	µg/kg	17	U	17	U	16	U	5	U	5	U	6	U
Xylene (total)	µg/kg	22	U	22	U	21	U	5	U	5	U	6	U
Total Petroleum Hydrocarbons by Modified 8015													
TPH-diesel	mg/kg	8.90	()B	5.40	()B	7.40	()B	11	U	13		12	U
TPH-gasoline	mg/kg	-		-		-		1.30	J	0.12	J	0.11	()J

Sample IDs ending with D are duplicate samples

mg/kg milligrams/kilogram

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit

Table F-1 (Continued) Site 7: Soil Data Summary Table

171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

LOCATOR:		7-B17		7-B17		7-B18		7-B18		7-B18		7-B19	
SAMPLE ID:		P-S7-B17-0305		P-S7-B17-0709		P-S7-B18-0305		P-S7-B18-0305D		P-S7-B18-12125		P-S7-B19-0305	
COLLECTION DATE:		08/29/95		08/29/95		08/29/95		08/29/95		08/29/95		08/29/95	
ASSOCIATED QC:		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195		P-TB2-082995,P-ER1-082995 FB1-083195, FB2-083195	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Volatile Compounds by 8240													
Benzene	µg/kg	6	U	6	U	6	U	7	U	6	U	6	U
Ethylbenzene	µg/kg	6	U	6	U	6	U	7	U	6	U	6	U
Toluene	µg/kg	6	U	6	U	6	U	7	U	6	U	6	U
Xylene (total)	µg/kg	6	U	6	U	6	U	7	U	6	U	6	U
Total Petroleum Hydrocarbons by Modified 8015													
TPH-diesel	mg/kg	11	U	8	()	11	U	12	U	11	U	11	U
TPH-gasoline	mg/kg	0.11	U	0.11	U	0.11	U	0.12	U	0.11	U	0.11	U

Sample IDs ending with D are duplicate samples

mg/kg milligrams/kilogram
µg/kg micrograms/kilogram

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Possible blank contamination
J Reported value is estimated

Table F-2 Site 7: Sediment Data Summary Table

171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

LOCATOR:		7-SD01		7-SD07		7-SD02		7-SD03		7-SD04		7-SD05	
SAMPLE ID:		P-S7-SD01		P-S7-SD01D		P-S7-SD02		P-S7-SD03		P-S7-SD04		P-S7-SD05	
COLLECTION DATE:		11/17/94		11/17/94		11/17/94		11/17/94		11/17/94		11/17/94	
ASSOCIATED QC:		P-S7-TB2-1117,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1117,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1117,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1117,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1117,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116		P-S7-TB2-1117,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116	
	UNITS:	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL	RESULT	QUAL
Volatile Compounds by 8240													
Benzene	µg/kg	19	U	19	U	23	U	20	U	21	U	20	U
Ethylbenzene	µg/kg	19	U	19	U	23	U	20	U	21	U	20	U
Toluene	µg/kg	19	U	19	U	23	U	20	U	21	U	20	U
Xylene (total)	µg/kg	26	U	26	U	31	U	27	U	28	U	26	U
Total Petroleum Hydrocarbons by Modified 8015													
TPH-diesel	mg/kg	8.70	()B	5.40	()B	9.70	()B	6.30	()B	6.90	()B	5.60	()B
TPH-gasoline	mg/kg	-		-		-		-		-		-	

Data Validation Qualifiers

Table F-2 (Continued) Site 7: Sediment Data Summary Table

171st Air Refueling Wing, Pennsylvania Air National Guard, Coraopolis, Pennsylvania

LOCATOR:	7-SD06
SAMPLE ID:	P-S7-SD06
COLLECTION DATE:	11/17/94
ASSOCIATED QC:	P-S7-TB2-1117,P-S7-EB1-1116 S7-FB1-1116,S7-FB2-1116

	UNITS:	RESULT	QUAL
Volatile Compounds by 8240			
Benzene	µg/kg	21	U
Ethylbenzene	µg/kg	21	U
Toluene	µg/kg	21	U
Xylene (total)	µg/kg	28	U
Total Petroleum Hydrocarbons by Modified 8015			
TPH-diesel	mg/kg	11	()B
TPH-gasoline	mg/kg	-	

mg/kg milligrams/kilogram
µg/kg micrograms/kilogram

Data Validation Qualifiers
() Result is between the detection limit and the quantitation limit
B Possible blank contamination

171st Air Refueling Wing
Coraopolis, Pennsylvania
Data Validation of BTEX Samples Analyzed Using SW-846 Method 8240

Round 1 - Soil Samples

P-S7-B03-0001	P-S7-SD01	P-S7-SD02	P-S7-SD03
P-S7-SD04	P-S7-SD05	P-S7-SD06	P-S7-SD07
P-S7-B8-0911	P-S7-B1-0911	P-S7-B9-0305	P-S7-B7-0507
P-S7-B1-0406	P-S7-B2-0305	P-S7-B2-0709	P-S7-B4-0305
P-S7-B6-0305	P-S7-B6-0709	P-S7-B5-0305	P-S7-B10-0305
P-S7-B11-0305	P-S7-B11-0709	P-S7-B12-0305	P-S7-B12-0709
P-S7-B13-0406	P-S7-B14-0204	P-S7-B30-0709	P-S7-B31-0305

Round 1 - Water Samples

P-S7-EB11115	P-S7-FB11115	P-S7-FB21115	P-S7-EB21116
P-S7-EB31117			

Round 2 - Soil Samples

P-S7-SB1-0305	S-S7-SB2-0305	P-S7-SB3-0305	P-S7-SB3-0709
P-S7-SB4-0305	P-S7-SB4-0305D	P-S7-SB5-0305	P-S7-SB2-6585D
P-S7-SB2-6585	P-S7-SB4-12125		

Round 2 - Water Samples:

ER10829	ER2083095	FB1083195	FB2083195

I. Introduction

All samples were analyzed for benzene, ethylbenzene, toluene, and xylenes (BTEX) by SW-846 Method 8240.

II. Sample Holding Times: Acceptable/All criteria met

Discussion:

All samples analyzed within the required holding time of 14 days.

III. Initial and Continuing Calibration: Acceptable/All criteria met.

Discussion:

All relative response factors (RRF) were above the 0.05 lower control limit for all target compounds. No target compound reported a percent relative standard deviation (%RSD) above 30% for any sample. Continuing calibrations were performed at the proper frequency. All RRF were above the 0.05 control limit. No continuing calibrations reported compounds with response factor percent difference (%D) greater

than the maximum allowable value of +/- 25%.

IV. Blank Analyses: Acceptable/All criteria met.

Discussion:

Method blanks, field blanks, equipment rinseates, and trip blanks were analyzed at the required frequency. No target compounds were deteceted in the method blanks associated with the samples.

V. Surrogate Recovery: Acceptable/All criteria met.

Discussion:

No sample reported surrogate recoveries outside criteria.

VI. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Sample Analysis: Acceptable/All criteria met.

Discussion:

All spike recoveries (SR) and relative percent differences (RPD) were within the appropriate control limits.

VII. GC/MS Instrument Performance Check: Acceptable/All criteria met.

Discussion:

All ctiteria met, all samples injected within acceptable time windows.

VIII. Internal Standards: Acceptable/All criteria met.

Discussion:

All samples reported acceptable area counts and retention times.

171st Air Refueling Wing
Coraopolis, Pennsylvania
Data Validation of TPH Samples Analyzed Using SW-846 Method 8015

Round 1 - Soil Samples

P-S7-B03-0001	P-S7-SD01	P-S7-SD02	P-S7-SD03
P-S7-SD04	P-S7-SD05	P-S7-SD06	P-S7-SD07
P-S7-B8-0911	P-S7-B1-0911	P-S7-B9-0305	P-S7-B7-0507
P-S7-B1-0406	P-S7-B2-0305	P-S7-B2-0709	P-S7-B4-0305
P-S7-B6-0305	P-S7-B6-0709	P-S7-B5-0305	P-S7-B10-0305
P-S7-B11-0305	P-S7-B11-0709	P-S7-B12-0305	P-S7-B12-0709
P-S7-B13-0406	P-S7-B14-0204	P-S7-B30-0709	P-S7-B31-0305

Round 1 - Water Samples

P-S7-EB11115	P-S7-FB11115	P-S7-FB21115	P-S7-EB21116
P-S7-EB31117			

Round 2 - Soil Samples

P-S7-SB1-0305	S-S7-SB2-0305	P-S7-SB3-0305	P-S7-SB3-0709
P-S7-SB4-0305	P-S7-SB4-0305D	P-S7-SB5-0305	P-S7-SB2-6585D
P-S7-SB2-6585	P-S7-SB4-12125		

Round 2 - Water Samples:

ER10829	ER2083095	FB1083195	FB2083195

I. Introduction:

Round 1 samples were analyzed for diesel range TPH only. All Round 2 samples were analyzed for both diesel range and gasoline range TPH fractions. All samples were analyzed using SW-846 Method 8015 Modified California LUFT.

II. Sample Holding Times: Acceptable/All criteria met

Discussion:

All samples analyzed within the required holding time of 14 days.

III. Calibration: Acceptable/With the following exceptions.

Qualified Data: P-7-SB1-0305DL

Discussion:

All criteria were met during the initial and continuning calibrations for all TPH diesel range analyses. All inital calibrations met criteria during the TPH gasoline analyses, continuning calibrations on 9-13-95 failed to meet %RSD criteria. All associated samples were qualifed "J".

IV. Blank Analyses: Acceptable/With the following exceptions

Qualified Data: P-S7-SD01, P-S7-SD02, P-S7-SD03, P-S7-SD04, P-S7-SD05, P-S7-SD06, P-S7-SD07, P-S7-B2-0305, P-S7-B2-0709, P-S7-B4-0305, P-S7-B6-0305, P-S7-B6-0709, P-S7-B5-0305, P-S7-B10-0305, P-S7-B11-0305, P-S7-B11-0709, P-S7-B12-0305, P-S7-B12-0709, P-S7-B13-0406, P-S7-B14-0204, P-S7-B30-0709, P-S7-B31-0305

Discussion:

Method blanks, field blanks, equipment rinseates, and trip blanks were analyzed at the required frequency. Diesel range TPH was detected in several method blanks associated with Round 1 samples. All sample detects less than 5 times the concentration detected in the associated method blank were quaified "B".

V. Surrogate Recovery: Acceptable/All criteria met.

Discussion:

All diesel and gasoline range TPH analyses reported acceptable surrogate recoveries.

VI. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Sample Analysis: Acceptable/with the follwoing exceptions.

Discussion:

Two SDGs reported outliers with the MS/MSD analyses. One SDG reported high recoveries and one low recoveries. All other spike recoveries (SR) and relative percent differences (RPD) were within the appropriate control limits. Data were not qualified based on MS/MSD data alone.

29648

☐ RECRA Environmental, Inc.
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Columbia, MD 21046
TEL: (410) 381-2288
FAX: (410) 381-2329
Contract number: 93S0041DC4

☑ CompuChem Labs
3308 Chapel Hill/Nelson Hwy
Research Triangle Park, NC 27709
TEL: (919) 248-6762
FAX: (919) 248-6791
Contract number: 93S0044DC4

☐ Other:

Shipment No.: 1
Ship Method: Federal Express
Ship Date: 11/15/94
Airbill No.: 2116791751

TETC Contract/DO No.:
Project Name/Number: Penn ANG Pittsburgh Int'l Airport
Project Manager: Carol Frye

Client:
The Earth Technology Corporation
1420 King Street, Suite 600
Alexandria, VA 22314
TEL: (703) 549-8728
FAX: (703) 549-9134

The Earth Technology Corporation®

Lab job No. ______
Page 1 of 1

Analysis Required

Cooler Number	Field Sample Number	SBD	SED	Log Date	Log Time	Sample Matrix	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered √	Number of Containers	BTEX SW846/8020	PHC SW846/Mod 8015									Remarks
1	P-S7-EB1-1115	NA	NA	11/15/94	1620	WQ	40ml glass	4°C	HCL		2	✓										Dropped off and - 11-16-94
↓	P-S7-EB1-1115	↓	↓	↓	1620	↓	1 L amber	↓	—		1		✓									
↓	P-S7-FB1-1115	↓	↓	↓	1530	↓	40ml glass	↓	HCL		2	✓										
↓	P-S7-FB1-1115	↓	↓	↓	1530	↓	1 L amber	↓	—		1		✓									
↓	P-S7-FB2-1115	↓	↓	↓	1600	↓	40ml glass	↓	HCL		2	✓										
↓	P-S7-FB2-1115	↓	↓	↓	1600	↓	1 L amber	↓	—		1		✓									
↓	P-S7-TB1-1115	↓	↓	↓	0700	↓	40ml glass	↓	HCL		1	✓										
↓	P-S7-B1-0406	04'	06'	↓	1010	SO	1" dia SS sleeve	↓	—		1	✓	✓									
↓	P-S7-B1-0911	09'	11'	↓	1045	↓	↓	↓	↓		1	✓	✓									
↓	P-S7-B7-0507	05'	07'	↓	1235	↓	↓	↓	↓		1	✓	✓									
↓	P-S7-B8-0911	09'	11'	↓	1355	↓	↓	↓	↓		2	✓	✓									
↓	P-S7-B9-0305	03'	05'	↓	1420	↓	↓	↓	↓		1	✓	✓									

RECEIVED IN GOOD CONDITION 11-16-94

Sampler's Signature

Relinquished by	Date	Received by	Date	Relinquished by	Date	Received by	Date
Signature M. Sean Phillips	11/15/94	Signature J. Purdie	11-16-94	Signature		Signature	
Printed M. Sean Phillips	Time	Printed J. Purdie	Time	Printed	Time	Printed	Time
Company EarthTECH	1800	Company CompuChem	0830	Company		Company	
Reason Ship to Lab				Reason			

Comments ______

Relinquished by	Date	Received by	Date
Signature		Signature	
Printed	Time	Printed	Time
Company		Company	
Reason			

LEGEND
SBD: Sample Beginning Depth
SED: Sample Ending Depth
Sample Matrix:
SO - Soil
SE - Sediment
WG - Groundwater
WS - Surface Water
DC - Drill Cuttings
AG - Soil Gas
WQ - Field Quality Control Sample (TB, EB, AB)

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FAX: (410) 381-2329
Contract number: 93S0041DC4

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TEL: (919) 248-6762
FAX: (919) 248-6791
Contract number: 93S0044DC4

☐ Other:

Shipment No.: 2
Ship Method: Federal Express
Ship Date: 11/16/94 AM
Airbill No.: 1926711076

TETC Contract/DO No.:
Project Name/Number: Penn ANG Pittsburgh Int'l Airport
Project Manager: Carol Frye

The Earth Technology Corporation

Client:
The Earth Technology Corporation
1420 King Street, Suite 600
Alexandria, VA 22314
TEL: (703) 549-8728
FAX: (703) 549-9134

Lab job No. 29640
Page 1 of 2

Cooler Number	Field Sample Number	SBD	SED	Log Date	Log Time	Sample Matrix	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered Y	Number of Containers	Analysis Required: BTEX SW846/8240	Analysis Required: PAH SW846/Mod 8310	Remarks
2	P-57-TB2-1116.	NA	NA	11/16/94	0700	WQ	40ml VOA	4C	HCL		1	✓		Dropped P and G - 08.12.94
	P-57-EB2-1116.				1655		40ml VOA				2	✓		
	P-57-EB2-1116.				1655		1L amber				1		✓	
	P-57-B02-0305.	3'	5'		1630	SO	1" dia SS sleeve		—		1	✓	✓	
	P-57-B02-0709.	7'	9'		1645						1	✓	✓	
	P-57-B04-0305.	3'	5'		1605						1	✓	✓	
	P-57-B06-0305.	3'	5'		1545						1	✓	✓	
	P-57-B06-0709.	7'	9'		1555						1	✓	✓	
	P-57-B05-0305.	3'	5'		1530						1	✓	✓	
	P-57-B10-0305.	3'	5'		1020						1	✓	✓	
	P-57-B11-0305.	3'	5'		1046						1	✓	✓	
	P-57-B11-0709.	7'	9'		1100						1	✓	✓	

RECEIVED IN GOOD CONDITION

Sampler's Signature

LEGEND

SBD: Sample Beginning Depth
SED: Sample Ending Depth
Sample Matrix:
SO - Soil
SE - Sediment
WG - Groundwater
WS - Surface Water
DC - Drill Cuttings
AG - Soil Gas
WQ - Field Quality Control Sample (TB, EB, AB)

Relinquished by	Date	Received by	Date
Signature: M. Sean Phillips	11/16/94	Signature: J. Purdie	11/17/94
Printed: M. Sean Phillips	Time: 1700	Printed: J. Purdie	Time: 0900
Company: EarthTECH		Company: CompuChem	
Reason: Sent to Lab			

Relinquished by	Date	Received by	Date
Signature		Signature	
Printed	Time	Printed	Time
Company		Company	
Reason			

Relinquished by	Date	Received by	Date
Signature		Signature	
Printed	Time	Printed	Time
Company		Company	
Reason			

Comments

Distribution: White to Laboratory, Canarary to WDC Office, Pink to Field Log, Goldenrod to Courier or Fed Ex/ Log.

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Columbia, MD 21046
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Contract number: 93S0041DC4

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TEL: (919) 248-6762
FAX: (919) 248-6791
Contract number: 93S0044DC4

☐ Other:

Shipment No.: 2
Ship Method: Federal Express
Ship Date: 11/16/94
Airbill No.: 1926711076

TETC Contract/DO No.:
Project Name/Number: Penn ANG Pittsburgh Int'l Airport
Project Manager: Carol Frye

The Earth Technology Corporation

Client:
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1420 King Street, Suite 600
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FAX: (703) 549-9134

Lab job No. 29640
Page 2 of 2

Cooler Number	Field Sample Number	SBD	SED	Log Date	Log Time	Sample Matrix	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered Y	Number of Containers	BTEX SW846/8240	PHC SW846/Mod 8015	Remarks
2	P-S7-B12-0305.	3'	5'	11/16/94	1325	SO	1" glass sleeve	4°C	—		1	✓	✓	Dropped and broke 11.17.94
	P-S7-B12-0709.	7'	9'		1335						1	✓	✓	
	P-S7-B13-0406.	4'	6'		1440						1	✓	✓	
	P-S7-B14-0204.	2'	4'		1705						1	✓	✓	
	P-S7-B30-0709.	7'	9'		1145						2	✓	✓	
	P-S7-B31-0305.	3'	5'		1402						1	✓	✓	

Last sample 11/16/94
MAP

RECEIVED IN GOOD CONDITION

Sampler's Signature

LEGEND

SBD: Sample Beginning Depth
SED: Sample Ending Depth
Sample Matrix:
SO - Soil
SE - Sediment
WG - Groundwater
WS - Surface Water
DC - Drill Cuttings
AG - Soil Gas
WQ - Field Quality Control Sample (TB, EB, AB)

Relinquished by	Date	Received by	Date
Signature M. Sean Phillips	11/16/94	Signature J. Purdie	11-17-94
Printed M. Sean Phillips	Time 1800	Printed J. Purdie	Time 0900
Company EarthTech		Company CompuChem	
Reason Sent to Lab			

Relinquished by	Date	Received by	Date
Signature		Signature	
Printed	Time	Printed	Time
Company		Company	
Reason			

Comments

Relinquished by	Date	Received by	Date
Signature		Signature	
Printed	Time	Printed	Time
Company		Company	
Reason			

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FAX: (410) 381-2329
Contract number: 93S0041DC4

☑ CompuChem Labs
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Research Triangle Park, NC 27709
TEL: (919) 248-6762
FAX: (919) 248-6791
Contract number: 93S0044DC4

☐ Other: _____

Shipment No.: 3
Ship Method: Federal Express
Ship Date: 11/17/94
Airbill No.: 1926711054

TETC Contract/DO No.: _____
Project Name/Number: Penn ANG Pittsburgh Int'l Airport
Project Manager: Carol Frye

Client: #29646
The Earth Technology Corporation
1420 King Street, Suite 600
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TEL: (703) 549-8728
FAX: (703) 549-9134

The Earth Technology Corporation

Lab job No. _____
Page 1 of 2

Cooler Number	Field Sample Number	SBD	SED	Log Date	Log Time	Sample Matrix	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered √	Number of Containers	BTEX SW846/8240	PHC SW846/Mod 8015	Remarks
3	P-S7-TB3-1117	NA	NA	11/17/94	0800	WQ	40ml VOA	4°C	HCL		1	✓		Deleted P thyphens from ID3
	P-S7-EB3-1117				1135		40ml VOA		HCL		2	✓		
	P-S7-EB3-1117				1155		1L Amber		—		1		✓	
	P-S7-DECON-1117				1550		40ml VOA		HCL		2	✓		
	P-S7-DECON-1117	✓	✓		1550	✓	1L Amber		—		1		✓	
	P-S7-B03-0001	0	1'		1120	SO	100ml Amber				2	✓	✓	
	P-S7-SD01				1340						2	✓	✓	Deleted hyphens from ID3 CE 11/18/94
	P-S7-SD02				1405						2	✓	✓	
	P-S7-SD03				1415						2	✓	✓	
	P-S7-SD04				1445						2	✓	✓	
	P-S7-SD05				1455						2	✓	✓	
	P-S7-SD06	✓	✓	✓	1500	✓	✓	✓	✓		2	✓	✓	

Sampler's Signature: M. Sean Phillips

LEGEND

SBD: Sample Beginning Depth
SED: Sample Ending Depth
Sample Matrix:
SO - Soil
SE - Sediment
WG - Groundwater
WS - Surface Water
DC - Drill Cuttings
AG - Soil Gas
WQ - Field Quality Control Sample (TB, EB, AB)

Relinquished by	Date	Received by	Date	Relinquished by	Date	Received by	Date
Signature: M Sean Phillips	11/17/94	Signature:		Signature:		Signature:	11/18/94
Printed: M. Sean Phillips	Time	Printed:	Time	Printed:	Time	Printed: C TEVANS	Time
Company: Earth TECH	1700	Company:		Company:		Company: CompuChem	0830
Reason: Sent to Lab				Reason:			

Comments: RECEIVED GOOD CONDITION (160 Does TPH Require pres.? TPH PH = 6) 11/18/94

Distribution: White to Laboratory, Canarary to WDC Office, Pink to Field Log, Goldenrod to Courier or Fed Ex/ Log.

#29640

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Contract number: 93S0041DC4

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TEL: (919) 248-6762
FAX: (919) 248-6791
Contract number: 93S0044DC4

☐ Other:

Shipment No.: 3
Ship Method: Federal Express
Ship Date: 11/17/94
Airbill No.: 1926711054

TETC Contract/DO No.:
Project Name/Number: Penn LNG Pittsburg Int'l Airport
Project Manager: Carol Frye

The Earth Technology Corporation®

Client:
The Earth Technology Corporation
1420 King Street, Suite 600
Alexandria, VA 22314
TEL: (703) 549-8728
FAX: (703) 549-9134

Lab job No.
Page 2 of 2

Cooler Number	Field Sample Number	SBD	SED	Log Date	Log Time	Sample Matrix	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered √	Number of Containers	Analysis Required: BTEX SW846/8240	Analysis Required: PNA SW846/Mod8015	Remarks
3	P-SS-SD07	0	1'	11/17/94	1400	SO	100ml amber	4C	—		2	✓	✓	

Last sample 11/17/94

Sampler's Signature: M. Sean Phillips

LEGEND

SBD: Sample Beginning Depth
SED: Sample Ending Depth
Sample Matrix:
SO - Soil
SE - Sediment
WG - Groundwater
WS - Surface Water
DC - Drill Cuttings
AG - Soil Gas
WQ - Field Quality Control Sample (TB, EB, AB)

Relinquished by	Date	Received by	Date	Relinquished by	Date	Received by	Date
Signature: M. Sean Phillips	11/17/94	Signature:		Signature:		Signature:	11/18/94
Printed: M. Sean Phillips	Time 1900	Printed:	Time	Printed:	Time	Printed: C. EVANS	Time 0830
Company: Earth Tech		Company:		Company:		Company: Courier	
Reason: Sent to Lab				Reason:			

Comments: TPH H2O ph=6

GOOD CONDITION

Chain-of-Custody Record

Inchcape Testing Services
Aquatec Laboratories
55 South Park Drive
Colchester, VT 05446
TEL: (802) 655-1203
FAX: (802) 655-1248

COMPANY INFORMATION

Name: Earth Tech
Address: 800 Oak Ridge Turnpike Suite C-100 Oak Ridge TN 37830
Telephone: 615 483 9404
Facsimile: 615 481 3834
Contact Name: Carol Frye

COMPANY'S PROJECT INFORMATION

Project Name: PA ANG 171st ARW
Project Number: 948902-04
Sampler Name(s): Patrick H Lay

SHIPPING INFORMATION

Carrier: Fed Express
Airbill Number: 5056300115
Date Shipped: 8/30/95
Hand Delivered: ☐ yes ☑ no

INCHCAPE LABORATORY INFORMATION

Quote #:
Client Code:

SAMPLE IDENTIFICATION (NOTE 1)	COLLECTION DATE	COLLECTION TIME	GRAB	COMPOSITE	MATRIX	ANALYSIS/REMARKS (NOTE 2,3)	VOLUME/CONTAINER TYPE/ PRESERVATIVE (NOTE 4): 40 ml / glass / HCl	1 Liter / Glass / None	1" / Stainless / None	40ml / glass / None			NUMBER OF CONTAINERS
P-TB2-082995	8/22/95	1100	TRIP	Blank	H_2O	BTEX	1						1
P-ER2-083095	8/30/95	1550	✓		H_2O	BTEX TPH	2	1		3			6
P-7-SB1-3-5	8/29/95	0935	✓		Soil	BTEX TPH (Full MS/MSD Also)			3				3
P-7-SB2-3-5	8/29/95	1130	✓		Soil	BTEX TPH			3				3
P-7-SB2-6.5-8.5	8/29/95	1145	✓		Soil	BTEX TPH			2				2
P-7-SB3-3-5	8/29/95	1335	✓		Soil	BTEX TPH			2				2
P-7-SB3-7-9	8/29/95	1410	✓		Soil	BTEX TPH			3				3
P-7-SB4-3-5	8/29/95	1450	✓		Soil	BTEX TPH			4				4
P-7-SB4-3-SD	8/29/95	1450			Soil	BTEX TPH (Sample Container Kept Above Sample)							
	Next Page												

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
Patrick H Lay	8/29/95	1730	
Relinquished by: (signature)	DATE	TIME	Received by: (signature)
Relinquished by: (signature)	DATE	TIME	Received for Laboratory by: (signature)

NOTES TO SAMPLER(S): (1) Limit Sample Identification to 6 characters, if possible; (2) Indicate designated Lab Q.C. sample and type (e.g.: MS/MSD/REP) and provide sufficient sample; (3) Field duplicates are separate sample; (4) e.g.: 40 ml/glass/H_2SO_4

Notes to Lab:

Chain-of-Custody Record

Inchcape Testing Services
Aquatec Laboratories

55 South Park Drive
Colchester, VT 05446

TEL: (802) 655-1203
FAX: (802) 655-1248

PAGE ___ OF ___

COMPANY INFORMATION

Name: Earth Tech
Address: 800 Oak Ridge Turnpike
Suite C-100
Oak Ridge TN 37830
Telephone: 615 483 9401
Facsimile: 615 481 3834
Contact Name: Carol Fry

COMPANY'S PROJECT INFORMATION

Project Name: PA Air National Guard-171st ARW
Project Number: 948902
Sampler Name(s): Patrick Lay

SHIPPING INFORMATION

Carrier: Fed Express
Airbill Number: 505630013 0
Date Shipped: 8/30/95
Hand Delivered: ☐ yes ☒ no

INCHCAPE LABORATORY INFORMATION

Quote #:
Client Code:

SAMPLE IDENTIFICATION (NOTE 1)	COLLECTION DATE	COLLECTION TIME	GRAB	COMPOSITE	MATRIX	ANALYSIS/REMARKS (NOTE 2,3)	VOLUME/CONTAINER TYPE/PRESERVATIVE (NOTE 4): 40ml/glass/HCl	8oz/Stainless/none	1 Liter/Glass/none	1 Liter/Plastic/HNO3	1"/Stainless/none	NUMBER OF CONTAINERS
P-TB1-082995	8/22/95	1100	Trip Blank		Water	VOCs	1					1
P-B-HA3-0.5	8/28/95	1215	✓		Soil	VOCs SVOCs TPH PP METALS		1				1
P-B-HA4-0.5	8/28/95	1230	✓		Soil	VOCs SVOCs TPH PP Metals		1				1
P-ER1-082995	8/29/95	1800	✓		Water	VOCs SVOCs TPH PP METALS	6		2	1		3
P-A-SB1-2-4	8/29/95	1721	✓		Soil	VOCs SVOCs TPH PP Metals					3	3
P-A-SB1-8-10	8/29/95	1730	✓		Soil	VOCs SVOCs TPH PP Metals					4	4
P-A-SB2-3-5	8/29/95	1800	✓		Soil	VOCs, SVOCs TPH PP Metals					4	4
P-A-SB2-6.5-8.5	8/29/95	1810	✓		Soil	VOCs, SVOCs TPH PP Metals					4	4
P-A-SB2-6.5-8.5D	8/29/95	1810	✓		Soil	VOCs, SVOCs, TPH PP Metal					4	4
						# Duplicate Sample contained in above Sample						

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
Carol Fry	8/30/95	1330	
Relinquished by: (signature)	DATE	TIME	Received by: (signature)

NOTES TO SAMPLER(S): (1) Limit Sample Identification to 6 characters, if possible; (2) Indicate designated Lab Q.C. sample and type (e.g.: MS/MSD/REP) and provide sufficient sample; (3) Field duplicates are separate sample; (4) e.g.: 40 ml/glass/H_2SO_4

Notes to Lab:

Chain-of-Custody Record

Inchcape Testing Services
Aquatec Laboratories

55 South Park Drive
Colchester, VT 05446

TEL: (802) 655-1203
FAX: (802) 655-1248

COMPANY INFORMATION

Name: EARTH TECH
Address: 800 OAK RIDGE TURNPIKE SUITE C-100 OAK RIDGE TN 37830
Telephone: 615 483 9404
Facsimile: 615 481 3834
Contact Name: Carol Frye

COMPANY'S PROJECT INFORMATION

Project Name: PA ANG 171ST ARW
Project Number: 948902
Sampler Name(s): Patrick Lay

SHIPPING INFORMATION

Carrier: FED EXPRESS
Airbill Number: 505630015
Date Shipped: 8/30/95
Hand Delivered: ☐ yes ☑ no

INCHCAPE LABORATORY INFORMATION

Quote #:
Client Code:

SAMPLE IDENTIFICATION (NOTE 1)	COLLECTION DATE	COLLECTION TIME	GRAB	COMPOSITE	MATRIX	ANALYSIS/REMARKS (NOTE 2,3)	VOLUME/CONTAINER TYPE/ PRESERVATIVE (NOTE 4)	NUMBER OF CONTAINERS
P-7-SB4 12-12.5	8/29/95	1525	✓		Soil	BTEX TPH	VOAs	1
P-7-SB5-3-5	8/29/95	1625	✓		Soil	BTEX TPH	VOAs	2

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
Patrick Lay	8/30/95	1730	
Relinquished by: (signature)	DATE	TIME	Received by: (signature)
Relinquished by: (signature)	DATE	TIME	Received for Laboratory by: (signature)

NOTES TO SAMPLER(S): (1) Limit Sample Identification to 6 characters, if possible; (2) Indicate designated Lab Q.C. sample and type (e.g.: MS/MSD/REP) and provide sufficient sample; (3) Field duplicates are separate sample; (4) e.g.: 40 ml/glass/H_2SO_4

Notes to Lab:

Chain-of-Custody Record

Inchcape Testing Services
Aquatec Laboratories

55 South Park Drive
Colchester, VT 05446

TEL: (802) 655-1203
FAX: (802) 655-1248

PAGE ___ OF ___

COMPANY INFORMATION	COMPANY'S PROJECT INFORMATION	SHIPPING INFORMATION
me: EARTH TECH	Project Name: PA ANG 171ST ARW	Carrier: Fedexpress
ddress: 800-Oak Ridge Turn Pike Suite C-100 Oak Ridge TN 37830	Project Number: 948902	Airbill Number: 505630012 6
lephone: 615 483 9404	Sampler Name(s): Patrick Hay	Date Shipped: 8/31/95
acsimile: 615 481 3834		Hand Delivered: ☐ yes ☒ no
ontact Name: Carol Frye	INCHCAPE LABORATORY INFORMATION	Quote #: / Client Code:

SAMPLE IDENTIFICATION (NOTE 1)	COLLECTION DATE	COLLECTION TIME	GRAB	COMPOSITE	MATRIX	ANALYSIS/REMARKS (NOTE 2,3)	VOLUME/CONTAINER TYPE/ PRESERVATIVE (NOTE 4)	NUMBER OF CONTAINERS
D-FB1-083195	8/31/95	1500	✓		water	BTEX, TPH (Potable)	40ml / glass / HCl	3
D-FB2-083195	8/31/95	1600	✓		water	BTEX, TPH (DI)	40ml / glass /	3
D-TB3-083195	8/30/95	1543	TRIP BLANK			BTEX	1 Liter / glass /	1
							/ / /	
							/ / /	
							/ / /	
							/ / /	
							/ / /	
							/ / /	
							/ / /	

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
Patrick Hay	8/31/95	PM	
Relinquished by: (signature)	DATE	TIME	Received by: (signature)
	DATE	TIME	Received for Laboratory by: (signature)

NOTES TO SAMPLER(S): (1) Limit Sample Identification to 6 characters, if possible; (2) Indicate designated Lab Q.C. sample and type (e.g.: MS/MSD/REP) and provide sufficient sample; (3) Field duplicates are separate sample; (4) e.g.: 40 ml/glass/H_2SO_4

Notes to Lab: _____

Appendix G: Surveying Data

Dwg #21 4.0

Liadis Engineering & Surveying, Inc.

3100 Banksville Road
Pittsburgh, Pennsylvania 15216
Fax: (412) 341-6672
Telephone: (412) 341-6006

December 5, 1994

Ms. Jami Greenwald
The Earth Technology Corporation
1420 King Street
Alexandria, Virginia 22314

RE: Pennsylvania Air National Guard Base
Well & Test Boring Locations and Elevations

Dear Ms. Greenwald:

Enclosed is a list of coordinates for the points located at the Pennsylvania National Guard Base, Pittsburgh, PA

Horizontal Control Was established from existing monumentation at the U.S.A.F. Base and is on the State Plane Coordinates System.

Vertical Control was established from BM 680 used for construction of S.R. 6060.

Should you require any additional information or have any questions, please feel free to call.

Sincerely;

John A. Kugler

PENNSYLVANIA AIR NATIONAL GUARD
PITTSBURGH INTERNATIONAL AIRPORT
TEST BORING AND WELL LOCATIONS AND ELEVATIONS
BASED ON FIELD SURVEY CONDUCTED ON 11/22/94

NORTHING	EASTING	ELEVATION	DESCRIPTION
429411.4048	1318501.0690	1113.58	PZ-4
429671.7282	1318813.5811	1116.64	B-7
429584.2944	1318790.8218	1115.30	B-8
429575.4762	1318803.7435	1115.37	FUEL-37
429422.4255	1318800.5092	1113.32	B-9
429264.3708	1318746.2935	1110.84	B-10
429255.1338	1318794.9486	1111.12	B-11
429190.9893	1318786.2349	1110.24	PZ-5
428643.8936	1318782.8281	1103.40	B-12
428657.0266	1318776.5607	1103.77	FUEL-5
428663.3993	1318790.9248	1103.56	FUEL-UNK
428775.7964	1318675.3737	1105.45	FUEL-6
428785.1906	1318669.4301	1105.35	B-13
428802.6779	1318393.7225	1104.01	PZ-6
429415.4651	1318491.8419	1115.97	HYD-10
429659.2597	1318265.8434	1103.68	B-14
429648.2518	1317923.2746	1078.16	PZ-3
429514.9003	1318021.4903	1075.48	BO4
429491.8765	1318027.3298	1075.22	LFBC-115
429442.3051	1318021.4498	1075.24	RFBC-115
429411.3065	1318089.3406	1075.38	B-3
429427.4863	1317955.5698	1075.57	B-5
429463.0290	1317908.9195	1075.36	B-6
429459.5647	1317903.4034	1075.62	BC-114
429437.7502	1317900.6093	1075.53	BC-114
429462.7931	1317865.1093	1074.24	B-2
429462.7931	1317865.1093	1073.97	PZ-2
429697.4560	1317824.5870	1051.68	SD-01
429647.6728	1317787.1153	1043.52	SD-02
429578.8437	1317791.8630	1041.69	SD-03
429542.8234	1317800.5339	1045.22	SD-04
429536.7288	1317829.2445	1063.68	OUTFLO
429645.1822	1317863.4593	1070.18	OUTFLO
429433.9794	1317752.8740	1039.13	SD-05
429344.7665	1317721.2259	1035.76	SD-06
429297.6287	1317856.8088	1073.81	B-01
429275.9286	1317785.8675	1070.97	PZ-1

Liadis Engineering & Surveying, Inc.

3100 Banksville Road
Pittsburgh, Pennsylvania 15216
Fax:(412)341-6672
Telephone:(412)341-6006

September 8, 1995

E-TECH.LST

Ms. Jami Greenwald
The Earth Technology Corporation
1420 King Street
Alexandria, VA. 22314

RE: AIR NATIONAL GUARD - PITTSBURGH INTERNATIONAL AIRPORT

Dear Ms. Greenwald:

Enclosed is the coordinate listing of the points requested by your field personnel.

Horizontal and vertical control, previously established on the base, was used as reference coordinates and elevations.

If you have any questions or require any assistance, please contact the undersigned at your convenience.

Sincerely;

David M. Kalina, P.L.S.

SURVEY DATE: 09/01/95 - AIR NATIONAL GUARD BASE - PGH. INTERNATIONAL AIRPORT
TEST BORING AND WELL LOCATIONS

Point	Northing	Easting	Elevation	Description
100	429476.2476	1318319.7956	1113.5	C-BLDG 116
101	429465.8434	1318399.1206	1113.8	C-BLDG 116
102	429533.8374	1318408.6046	1116.01	SG-10
103	429565.9655	1318338.5877	1116.8	C/PK-LOT
104	429780.8950	1318367.2625	1117.2	C/PK-LOT
105	429866.9828	1318402.2408	1117.6	C/PK-LOT
106	429930.3890	1318379.8437	1117.57	SG-11
107	429896.9973	1318616.8266	1118.42	SG-13
108	429842.6240	1318614.2417	1118.1	C/CO-ASP
109	429825.2962	1318605.2868	1118.18	SG-3
110	429804.1322	1318499.8836	1116.4	C/CO-ASP
111	429579.0305	1318468.9555	1115.4	C/CO-ASP
112	429564.0806	1318600.1555	1115.3	C/CO-ASP
113	429419.9966	1318560.3607	1112.55	SG-17
114	428747.8483	1318818.6677	1103.81	66
115	428730.5277	1318918.6075	1102.79	SB-4 - 65
116	428695.7950	1318947.8398	1102.71	64
117	428657.6723	1318991.7378	1102.26	SB-7
118	428632.8698	1318956.0642	1102.26	63
119	428594.3707	1318984.4485	1102.30	SB-6
120	428600.8805	1318939.5300	1102.31	SB-1
121	428579.8325	1318919.1462	1102.28	62
122	428546.0041	1318878.1119	1102.44	SB-3 - 70
123	428569.0975	1318833.9656	1102.96	69
124	428607.5356	1318885.1813	1102.89	SB-2 - 60
125	428643.9465	1318782.7543	1103.57	SG-50
126	428642.9223	1318750.4979	1103.96	68
127	428700.7952	1318785.1602	1103.89	SB-5 - 67
128	428657.0704	1318776.5224	1103.8	FUEL-5
129	428663.4781	1318790.9149	1103.5	FUEL
130	428674.9419	1318904.1911	1102.8	SG-61
131	428761.6659	1319002.4956	1103.1	C/CO
132	428572.0832	1319025.5115	1102.4	MON
133	428529.8211	1319031.7868	1102.4	C/CO
134	428366.9989	1318901.7079	1102.3	C/BLDG-307
135	428328.9229	1318934.1098	1102.2	C/BLDG-307
136	428268.6346	1318912.5175	1092.28	4
137	428238.7858	1318869.0332	1095.86	3
138	428211.2672	1318845.2768	1094.41	2
139	428178.1598	1318858.2795	1085.71	1
140	428138.4050	1318889.7955	1077.1	C/CO-ASP
141	428208.2239	1318811.5430	1101.9	T/STP
142	428236.3840	1318825.3758	1102.0	C/BLDG-307
143	428316.9014	1318944.9255	1102.4	C/TELE-VLT
144	428317.1959	1318947.3577	1102.4	C/TELE-VLT
145	428313.2387	1318947.8004	1102.3	C/TELE-VLT
146	429443.5565	1318390.8989	1113.4	SG-19
147	429452.4643	1318289.5416	1111.73	SG-20

Appendix H: Applicable or Relevant and Appropriate Requirements

PaDEP Statewide
Human Health Standards for Soils

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
PHOSPHORIC ACID	07664382						
PHOSPHORUS OXYCHLORIDE	10025873						
PHOSPHORUS PENTACHLORIDE	10026138						
PHOSPHORUS PENTASULFIDE	01314803						
PHOSPHORUS TRICHLORIDE	07719122						
PHTHALIC ANHYDRIDE	00085449			1.60E+08	2.00E+09	4.50E+02	
PHTHALODINITRILE, M-	00626175						
PICLORAM	01918021						
PICOLINE, 2-	00109068						
PICRIC ACID	00088891						
PINDONE	00083261						
PIPERAZINE DIHYDROCHLORIDE	00142643						
PLATINUM	07440064						
POLYCHLORINATED BIPHENYLS (PCB) [3]	01336363			5.00E+03			
PROMETON	01610180						
PRONAMIDE	23950585						
PROPACHLOR	01918167						
PROPANOL, 1-	00071238						
PROPANOL, 2- (ISOPROPYL ALCOHOL)	00067630						
PROPARGYL ALCOHOL	00107197						
PROPAZINE	00139402						
PROPHAM	00122429						
PROPIOLACTONE, BETA	00057578						
PROPIONIC ACID	00079094						
PROPIONITRILE	00107120						
PROPYL ACETATE, N-	00109604						
PROPYL NITRATE, N-	00627134						
PROPYLENE GLYCOL DINITRATE	06423434						
PROPYLENE GLYCOL MONOMETHYL ETHER	00107982						
PROPYLENE IMINE	00075558						
PROPYLENE OXIDE	00075569						
PYRENE	00129000			2.00E+08	3.00E+07	3.00E+05	8.00E+03
PYRETHRUM	08003347						
PYRIDINE	00110861			7.80E+04	1.00E+06	8.50E+01	
QUINONE	00106514						
RADON	14859677						
RDX (CYCLONITE)	00121824						
RESORCINOL	00108463						
RHODIUM	07440166						
RONNEL	00299843						
ROTENONE	00083794						
SAFROLE	00094597						
SELENIUM	07782492						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
SELENIUM HEXAFLUORIDE	07783791						
SESONE	00136787						
SILICA CRYSTALLINE CRISTOBALITE	14464461						
SILICA FUME	69012642						
SILICA FUSED	60676860						
SILICON	07440213						
SILICON CARBIDE	00409212						
SILICON TETRAHYDRIDE	07803625						
SILVER	07440224						
SIMAZINE	00122349						
SODIUM	07440235						
SODIUM AZIDE	26628228						
SODIUM BISULFITE	07631905						
SODIUM FLUOROACETATE	00062748						
SODIUM HYDROXIDE	01310732						
SODIUM METABISULFITE	07681574						
STIBINE	07803523						
STRONTIUM	07440246						
STRONTIUM CHROMATE	07789062						
STRYCHNINE	00057249						
STYRENE	00100425			1.00E+07	4.00E+08	1.00E+04	
SUBTILLISINS	01395217						
SULFIDE	18496258						
SULFOTEP	03689245						
SULFPROFOS	35400432						
SULFUR DIOXIDE	07446095						
SULFUR HEXAFLUORIDE	02551624						
SULFUR MONOCHLORIDE	10025679						
SULFUR PENTAFLUORIDE	05714227						
SULFUR TETRAFLUORIDE	07783600						
SULFURIC ACID	07664939						
SULFURYL FLUORIDE	02699798						
TANTALUM	07440257						
TANTALUM OXIDE	01314610						
TEBUTHIURON	34014181						
TELLURIUM	13494809						
TELLURIUM HEXAFLUORIDE	07783804						
TEMEPHOS	03383968						
TEPP	00107493						
TERBACIL	05902512						
TERBUFOS	13071799						
TERPHENYLS	26140603						
TETRACHLORO-1,2-DIFLUOROETHANE, 1,1,2,2-	00076120						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
ACENAPHTHENE	00083329			4.00E+06	6.00E+07	3.00E+04	7.00E+02
ACENAPHTHYLENE	00208968					3.30E+04	
ACETALDEHYDE	00075070						
ACETIC ACID	00064197						
ACETIC ANHYDRIDE	00108247						
ACETONE	00067641			8.00E+06	1.00E+08	4.00E+05	
ACETONITRILE	00075058						
ACETOPHENONE	00098862						
ACETYLAMINOFLUORENE, 2- (2AAF)	00053963						
ACETYLENE TETRABROMIDE	00079276						
ACIFLUORFEN	05094666						
ACROLEIN	00107028						
ACRYLAMIDE	00079061						
ACRYLIC ACID	00079107						
ACRYLONITRILE	00107131						
ALACHLOR	15972608						
ALDICARB	00116063						
ALDICARB SULFONE	01646884						
ALDICARB SULFOXIDE	01646873						
ALDRIN	00309002			2.00E+03	3.00E+04	5.00E+05	3.00E+01
ALLYL ALCOHOL	00107186						
ALLYL GLYCIDYL ETHER (AGE)	00106923						
ALLYL PROPYL DISULFIDE	02179591						
ALUMINUM	07429905						
ALUMINUM OXIDE	01344281						
AMETRYN	00834128						
AMINOBIPHENYL, 4-	00092671						
AMINOPYRIDENE, 2-	00504290						
AMITROLE	00061825						
AMMONIA	07664417						
AMMONIUM CHLORIDE	12125092						
AMMONIUM PERFLUOROCTANOATE	03825261						
AMMONIUM SULFAMATE	07773060						
AMYL ACETATE, N-	00628637						
AMYL ACETATE, SEC-	00626380						
ANILINE	00062533			1.00E+05	1.00E+06	1.00E+02	
ANISIDINE	29191524						
ANTHRACENE	00120127			2.00E+07	3.00E+08	1.00E+06	2.00E+03
ANTIMONY	07440360						
ANTIMONY TRIOXIDE	01309644						
ANTU	00086884						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
ARAMITE	00140578						
ARSENIC	07440382						
ARSINE	07784421						
ASBESTOS	12001295						
ATRAZINE	01912249			3.00E+06	3.50E+07	6.00E+03	
AZINPHOS-METHYL	00086500						
BARIUM	07440393						
BARIUM SULFATE	07727437						
BAYGON (PROPOXUR)	00114261						
BENOMYL	17804352						
BENTAZON	25057890						
BENZENE	00071432			1.00E+02	2.00E+05	8.00E+02	2.00E+01
BENZIDINE	00092875						
BENZO[A]ANTHRACENE	00056553			6.00E+03	8.00E+03	5.00E+05	
BENZO[A]PYRENE	00050328			6.00E+02	8.00E+02	5.00E+05	
BENZO[B]FLUORANTHENE	00205992			6.00E+03	8.00E+03	5.00E+05	
BENZO[GHI]PERYLENE	00191242					5.00E+04	
BENZO[K]FLUORANTHENE	00207089			6.00E+04	8.00E+04	5.00E+05	
BENZOIC ACID	00065850			3.10E+08	4.00E+09	5.70E+02	
BENZOYL PEROXIDE	00094360						
BENZYL ALCOHOL	00100516						
BENZYL CHLORIDE	00100447						
BERYLLIUM	07440417						
BHC, ALPHA-	00319846			7.00E+02	1.00E+03	3.00E+04	
BHC, BETA-	00319857					4.00E+04	
BHC, DELTA-	00319868					3.00E+04	
BHC, GAMMA (LINDANE)	00058899			2.00E+04	6.00E+05	1.00E+04	
BIPHENYL	00092524						
BIS(2-CHLORO-1-METHYLETHYL)ETHER	00108601						
BIS(2-CHLORO-ISOPROPYL)ETHER	39638329						
BIS(2-CHLOROETHOXY)METHANE	00111911						
BIS(2-CHLOROETHYL)ETHER	00111444						
BIS(CHLOROMETHYL)ETHER	00542881						
BIS[2-ETHYLHEXYL] PHTHALATE	00117817			3.00E+05	4.00E+05	4.00E+05	
BISMUTH TELLURIDE	01304821						
BORON	07440428						
BORON OXIDE	01303862						
BORON TRIBROMIDE	10294334						
BORON TRIFLUORIDE	07637072						
BROMACIL	00314409						
BROMATE	07789380						
BROMINE	07726956						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
BROMINE PENTAFLUORIDE	07789302						
BROMOBENZENE	00108861						
BROMODICHLOROMETHANE	00075274			7.20E+04	9.20E+04	1.00E+04	
BROMOMETHANE	00074839						
BROMOPHENYL PHENYL ETHER, 4-	00101553						
BUTADIENE, 1,3-	00106990						
BUTANE	00106978						
BUTOXYETHANOL, 2- (EGBE)	00111762						
BUTYL ACETATE, N-	00123864						
BUTYL ACETATE, SEC-	00105464						
BUTYL ACETATE, TERT-	00540885						
BUTYL ALCOHOL, N-	00071363						
BUTYL ALCOHOL, SEC-	00078922						
BUTYL ALCOHOL, TERT-	00075650						
BUTYL CHROMATE, TERT-	01189851						
BUTYL GLYCIDYL ETHER, N- (BGE)	02426086						
BUTYL LACTATE, N-	00138227						
BUTYL MERCAPTAN	00109795						
BUTYL PHTHALATE, DI-N-	00084742						
BUTYLAMINE, N-	00109739						
BUTYLATE	02008415						
BUTYLBENZYL PHTHALATE	00085687			1.60E+07	2.00E+07	1.00E+05	
BUTYLPHENOL, O-SEC-	00089725						
BUTYLTOLUENE, P-TERT-	00098511						
CADMIUM	07440439						
CADMIUM OXIDE	01306190						
CALCIUM CARBONATE	01317653						
CALCIUM CHROMATE	13765190						
CALCIUM CYANAMIDE	00156627						
CALCIUM HYDROXIDE	01305620						
CALCIUM OXIDE	01305788						
CALCIUM SILICATE (SYNTHETIC)	01344952						
CALCIUM SULFATE	07778189						
CAMPHOR, SYNTHETIC	00076222						
CAPROLACTAM DUST	00105602						
CAPROLACTAM VAPOR	00105602						
CAPTAFOL	02425061						
CAPTAN	00133062						
CARBARYL	00063252						
CARBOFURAN	01563662						
CARBON BLACK	01333864						
CARBON DIOXIDE	00124389			7.00E+06	2.00E+08	8.00E+02	
CARBON DISULFIDE	00075150						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
CARBON MONOXIDE	00630080						
CARBON TETRABROMIDE	00558134						
CARBON TETRACHLORIDE	00056235			3.40E+04	4.40E+04	2.10E+03	
CARBONYL FLUORIDE	00353504						
CARBOXIN	05234684						
CATECHOL	00120809						
CELLULOSE	09004346						
CESIUM HYDROXIDE	21351791						
CHLORAL HYDRATE	00075876						
CHLORAMBEN	00133904						
CHLORAMINE	10599903						
CHLORDANE	00057749			3.00E+02	5.00E+03	5.00E+05	3.00E+02
CHLORDANE, ALPHA-	05103719						
CHLORDANE, GAMMA-	05103742						
CHLORINE	07782505						
CHLORINE DIOXIDE	10049044						
CHLORINE TRIFLUORIDE	07790912						
CHLORITE	07758192						
CHLORO-1-NITROPROPANE, 1-	00600259						
CHLORO-1-PROPENE, 3- (ALLYL CHLORIDE)	00107051						
CHLORO-M-CRESOL, P-	00059507						
CHLOROACETALDEHYDE	00107200						
CHLOROACETONE	00078955						
CHLOROACETOPHENONE, ALPHA-	00532274						
CHLOROACETYL CHLORIDE	00079049						
CHLOROANILINE, P-	00106478			1.00E+06	2.00E+07	1.00E+04	6.00E+01
CHLOROBENZENE	00108907						
CHLOROBENZILATE	00510156						
CHLOROBENZYLIDENE MALONONITRILE, O-	02698411						
CHLOROBROMOMETHANE	00074975						
CHLORODIBROMOMETHANE	00124481						
CHLORODIFLUOROMETHANE	00075456						
CHLOROETHANE	00075003						
CHLOROETHYL VINYL ETHER, 2-	00110758			7.00E+05	9.00E+05	1.00E+04	1.00E+01
CHLOROFORM	00067663						
CHLORONAPHTHALENE, 2-	00091587						
CHLOROPENTAFLUOROETHANE	00076153						
CHLOROPHENOL, 2-	00095578						
CHLOROPHENYL PHENYL ETHER, 4-	07005723						
CHLOROPICRIN	00076062						
CHLOROPRENE	00126998						
CHLOROPROPIONIC ACID, 2-	00598787						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
CHLOROSTYRENE, O-	02039874						
CHLOROTHALONIL	01897456						
CHLOROTOLUENE, O-	00095498						
CHLOROTOLUENE, P-	00106434						
CHLORPYRIFOS	02921882						
CHROMIUM (TOTAL)	07440473						
CHROMYL CHLORIDE	14977618						
CHRORODIBROMOMETHANE	00124481						
CHRYSENE	00218019			6.00E+05	7.80E+05	3.00E+05	
CLOPIDOL	02971906						
COBALT	07440484						
COBALT CARBONYL	10210681						
COBALT HYDROCARBONYL	16842038						
COPPER	07440508						
CRESOL	01319773						
CRESOL, M- (3-METHYLPHENOL)	00108394						
CRESOL, O-	00095487			3.00E+06	5.00E+07	5.00E+02	1.00E+01
CRESOL, P-	00106445			3.00E+05	5.00E+06	4.00E+02	1.00E+01
CROTONALDEHYDE	04170303						
CRUFOMATE	00299865						
CUMENE	00098828			6.00E+06	8.00E+07	1.00E+04	
CYANAMIDE	00420042						
CYANAZINE	21725462						
CYANIDE, TOTAL	00057125						
CYANOGEN	00460195						
CYANOGEN CHLORIDE	00506774						
CYCLOHEXANE	00110827						
CYCLOHEXANOL	00108930						
CYCLOHEXANONE	00108941						
CYCLOHEXENE	00110838						
CYCLOHEXYLAMINE	00108918						
CYCLOPENTADIENE	00542927						
CYCLOPENTANE	00287923						
CYHEXATIN	13121705						
DACTHAL (DCPA)	01861321						
DDD, 4,4'-	00072548			2.00E+04	2.40E+04	5.00E+05	2.00E+03
DDE, 4,4'-	00072559			1.00E+04	1.70E+04	5.00E+05	1.00E+03
DDT, 4,4'-	00050293			1.00E+04	1.70E+04	5.00E+05	1.00E+03
DECABORANE	17702419						
DECACHLOROBIPHENYL	02051243						
DEMETON	08065483						
DI-[2-ETHYLHEXYL] ADIPATE	00103231						
DI-TERT-BUTYL-P-CRESOL, 2,6	00128370						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
DIACETONE ALCOHOL	00123422						
DIALLATE	02303164						
DIAZINON	00333415						
DIAZOMETHANE	00334883						
DIBENZO[A,H]ANTHRACENE	00053703			6.00E+02	8.00E+02	5.00E+05	
DIBENZOFURAN	00132649					3.00E+04	
DIBORANE	19287457						
DIBROMO-3-CHLOROPROPANE, 1,2-	00096128						
DIBROMOACETONITRILE	03252435						
DIBROMOETHANE, 1,2-	00106934						
DIBROMOMETHANE	00074953						
DIBUTYL PHENYL PHOSPHATE	02528361						
DIBUTYL PHOSPHATE	00107664						
DIBUTYLAMINOETHANOL, 2-N-	00102818						
DICAMBA	01918000			2.30E+06	3.00E+04	6.00E+04	
DICHLORO-1-NITROETHANE, 1,1-	00594729						
DICHLORO-2-BUTENE, TRANS-1,3-	00110576						
DICHLORO-5,5-DIMETHYL HYDANTOIN, 1,3-	00118525						
DICHLOROACETONITRILE	03018120						
DICHLOROACETYLENE	07572294						
DICHLOROBENZENE, 1,2-	00095501			7.00E+06	9.00E+07	7.00E+03	2.00E+02
DICHLOROBENZENE, 1,3-	00541731			7.00E+06	9.00E+07	7.00E+03	
DICHLOROBENZENE, P-	00106467						2.00E+02
DICHLOROBENZIDINE, 3,3'-	00091941						
DICHLOROBIPHENYL	02051607						
DICHLORODIFLUOROMETHANE (FREON 12)	00075718			1.00E+07	2.00E+08	1.00E+03	
DICHLOROETHANE, 1,1-	00075343			7.00E+06	1.00E+08	5.00E+02	1.00E+01
DICHLOROETHANE, 1,2-	00107062			3.00E+05	6.30E+04	5.00E+02	
DICHLOROETHYLENE, 1,1-	00075354			7.00E+05	9.00E+06	1.00E+03	
DICHLOROETHYLENE, 1,2-	00540590						
DICHLOROETHYLENE, CIS-1,2-	00156592			8.00E+05	1.00E+07	7.00E+03	
DICHLOROETHYLENE, TRANS-1,2-	00156605			1.00E+06	2.00E+07	1.00E+04	
DICHLOROFLUOROMETHANE	00075434						
DICHLOROMETHANE	00075092			6.00E+05	4.00E+05	5.00E+02	
DICHLOROPHENOL, 2,4-	00120832			2.30E+05	3.00E+06	2.00E+03	
DICHLOROPHENOL, 2,6-	00087650						
DICHLOROPHENOXYACETIC ACID, 2,4- (2,4-D)	00094757			7.00E+05	1.00E+07	7.00E+03	6.00E+01
DICHLOROPROPANE, 1,2-	00078875					9.00E+02	
DICHLOROPROPANE, 1,3-	00142289						
DICHLOROPROPANE, 2,2-	00590207						
DICHLOROPROPENE, 1,1-	00563586						
DICHLOROPROPENE, CIS-1,3-	10061015						
DICHLOROPROPENE, TRANS-1,3-	10061026						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
DICHLOROPROPIONIC ACID, 2,2- (DALAPON)	00075990						
DICHLOROPROPYLENE, 1,3-	00542756						
DICHLOROTETRAFLUOROETHANE	00076142						
DICHLORVOS	00062737						
DICROTOPHOS	00141662						
DICYCLOPENTADIENE	00077736						
DICYCLOPENTADIENYL IRON	00102545						
DIELDRIN	00060571			3.00E+02	4.00E+02	9.00E+04	3.00E+01
DIETHANOLAMINE	00111422						
DIETHYL KETONE	00096220						
DIETHYL PHTHALATE	00084662			6.30E+07	8.00E+08	5.00E+05	
DIETHYLAMINE	00109897						
DIETHYLAMINOETHANOL, 2-	00100378						
DIETHYLENE TRIAMINE	00111400						
DIFLUORODIBROMOMETHANE	00075616						
DIGLYCIDYL ETHER (DGE)	02238075						
DIISOBUTYL KETONE	00108838						
DIISOPROPYL METHYLPHOSPHONATE	01445756						
DIISOPROPYLAMINE	00108189						
DIMETHOATE	00060515						
DIMETHRIN	67239161						
DIMETHYL ACETAMIDE, N,N-	00127195						
DIMETHYL METHYLPHOSPHONATE	00756796						
DIMETHYL PHTHALATE	00131113			7.80E+08	1.00E+10	3.70E+07	
DIMETHYL SULFATE	00077781						
DIMETHYLAMINE	00124403						
DIMETHYLAMINOAZOBENZENE, P-	00060117						
DIMETHYLANILINE	00121697						
DIMETHYLBENZ[A]ANTHRACENE, 7, 12-	00057976						
DIMETHYLBENZIDINE, 3,3'-	00119937						
DIMETHYLFORMAMIDE	00068122						
DIMETHYLHYDRAZINE, 1,1-	00057147						
DIMETHYLPHENETHYLAMINE, ALPHA, ALPHA-	00122098						
DIMETHYLPHENOL2,4-	00105679						
DINITOLMIDE	00148016						
DINITRO-O-CRESOL, 4,6-	00534521						
DINITROBENZENE	00528290						
DINITROBENZENE, 1,3-	00099650						
DINITROPHENOL, 2,4-	00051285						
DINITROTOLUENE	25321146						
DINITROTOLUENE, 2,4-	00121142						
DINITROTOLUENE, 2,6-	00606202						
DINITROTOLUENE, 2,6- (2,6-DNT)	00606202						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
DINOSEB	00088857						
DIOXANE, 1,4-	00123911						
DIOXATHION	00078342						
DIPHENAMID	00957517						
DIPHENYL OXIDE, CHLORINATED	55720995						
DIPHENYLAMINE	00122394						
DIPHENYLHYDRAZINE, 1,2-	00122667						
DIPROPYL KETONE	00123193						
DIPROPYLENE GLYCOL METHYL ETHER	34590948						
DIQUAT	00085007						
DIQUAT	00231367						
DISULFIRAM	00097778						
DISULFOTON	00298044						
DITHIANE, 1,4-	00505293						
DIURON	00330541						
DIVINYL BENZENE	01321740						
ENDOSULFAN	00115297			4.70E+05	6.00E+06		
ENDOSULFAN I	00959988			4.70E+05	6.00E+06	6.00E+04	
ENDOSULFAN II	33213659			4.70E+05	6.00E+06	6.00E+04	
ENDOSULFAN SULFATE	01031078						
ENDOSULFAN, ALPHA-	00095988						
ENDOSULFAN, BETA-	33212659						
ENDOTHALL	00145733						
ENDRIN	00072208			2.00E+04	3.00E+05	5.00E+05	2.00E+03
ENDRIN ALDEHYDE	07421934						
ENDRIN KETONE	53494705						
ENFLURANE	13838169						
EPICHLOROHYDRIN	00106898						
EPN	02104645						
ETHANOL	00064175						
ETHANOLAMINE	00141435						
ETHION	00563122						
ETHOXYETHANOL, 2- (EGEE)	00110805						
ETHOXYETHYL ACETATE, 2-(EGEEA)	00111159						
ETHYL ACETATE	00141786						
ETHYL ACRYLATE	00140885						
ETHYL AMYL KETONE	00541855						
ETHYL BENZENE	00100414			7.00E+06	1.00E+08	7.00E+04	1.00E+02
ETHYL BROMIDE	00074964						
ETHYL BUTYL KETONE	00106354						
ETHYL ETHER	00060297						
ETHYL FORMATE	00109944						
ETHYL MERCAPTAN	00075081						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
ETHYL METHANESULFONATE	00062500						
ETHYL SILICATE	00078104						
ETHYLAMINE	00075047						
ETHYLENE CHLORHYDRIN	00107073						
ETHYLENE DIBROMIDE, 1,2-	0016934						
ETHYLENE GLYCOL	00107211						
ETHYLENE GLYCOL DINITRATE	00628968						
ETHYLENE OXIDE	00075218						
ETHYLENE THIOUERA	00096457						
ETHYLENE THIOUREA	00096457						
ETHYLENEDIAMINE	00107153						
ETHYLENIMINE	00151564						
ETHYLIDENE NORBORNENE	16219753						
ETHYLMETHACRYLATE	00097632						
ETHYLMORPHOLINE, N-	00100743						
FAMPHUR	00052857						
FENAMIPHOS	22224926						
FENSULFOTHION	00115902						
FENTHION	00055389						
FERBAM	14484641						
FERROVANADIUM DUST	12604589						
FLUOMETURON	02164172			3.00E+06	4.00E+07	4.00E+05	1.00E+04
FLUORANTHENE	00206440			3.00E+06	8.00E+07	1.00E+05	
FLUORENE	00086737						
FLUORIDE	07782414			2.00E+07	6.00E+07	2.00E+03	
FLUORINE	00075694						
FLUOROTRICHLOROMETHANE (FREON 11)	00944229			1.00E+07	2.00E+08	1.00E+05	
FONOFOS	00050000						
FORMALDEHYDE	00075127						
FORMAMIDE	00064186						
FORMIC ACID	00098011						
FURFURAL	00098000						
FURFURYL ALCOHOL	07782652						
GERMANIUM TETRAHYDRIDE	00111308						
GLUTARALDEHYDE	00556525						
GLYCIDOL	01071836						
GLYPHOSATE	07440586						
HAFNIUM	00151677						
HALOTHANE	00076448			1.00E+03	1.00E+06	4.00E+05	1.00E+02
HEPTACHLOR	01024573			5.00E+02	6.00E+02	5.00E+05	
HEPTACHLOR EPOXIDE	28655712						
HEPTACHLOROBIPHENYL	00142825						
HEPTANE							

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
HEXACHLOROBENZENE	00118741			3.00E+03	4.00E+03	5.00E+05	
HEXACHLOROBIPHENYL	26601649						
HEXACHLOROBUTADIENE	00087683						
HEXACHLOROCYCLOPENTADIENE	00077474						
HEXACHLORODIBENZO-P-DIOXINS							
HEXACHLORODIBENZOFURANS							
HEXACHLOROETHANE	00067721			8.00E+04	1.00E+06	3.00E+04	
HEXACHLORONAPHTHALENE	01335871						
HEXACHLOROPHENE	00070304						
HEXACHLOROPROPENE	01888717						
HEXAFLUOROACETONE	00684462						
HEXAMETHYLENE DIISOCYANATE	00822060						
HEXANE	00110543						
HEXANEDIAMINE, 1,6-	00124094						
HEXANONE, 2- (METHYL N-BUTYL KETONE)	00591786					2.10E+02	
HEXAZINONEN	51235042						
HEXYL ACETATE, SEC-	00108849						
HEXYLENE GLYCOL	00107415						
HYDRAZINE	00302012						
HYDROGEN BROMIDE	10035106						
HYDROGEN CHLORIDE	07647010						
HYDROGEN CYANIDE	00074908						
HYDROGEN FLUORIDE	07664393						
HYDROGEN PEROXIDE	07722841						
HYDROGEN SELENIDE	07783075						
HYDROGEN SULFIDE	07783064						
HYDROGENATED TERPHENYLS	61788327						
HYDROQUINONE	00123319						
HYDROXYPROPYL ACRYLATE, 2-	00999611						
INDENE	00951361						
INDENO[1,2,3-CD]PYRENE	00193395			6.00E+03	8.00E+03	5.00E+05	
INDIUM	07440746						
IODINE	07553562						
IODOFORM	00075478						
IODOMETHANE	00074884						
IRON PENTACARBONYL	13463406						
IRONOXIDE FUME	01309371						
ISOAMYL ACETATE	00123922						
ISOAMYL ALCOHOL	00123513						
ISOBUTYL ACETATE	00110190						
ISOBUTYL ALCOHOL	00078831						
ISODRIN	00465736						
ISOOCTYL ALCOHOL	26952216						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
ISOPHORONE	00078591						
ISOPHORONE DIISOCYANATE	04098719						
ISOPROPOXYETHANOL	00109591						
ISOPROPYL ACETATE	00108214						
ISOPROPYL ETHER	00108203						
ISOPROPYL GLYCIDYL ETHER	04016142						
ISOPROPYL METHYLPHOSPHONATE	06838923						
ISOPROPYLAMINE	00075310						
ISOPROPYLANILINE, N-	00768525						
ISOSAFROLE	00120581						
KAOLIN	01332587					4.00E+05	
KEPONE	00143500						
KETENE	00463514						
LEAD [2]	07439921			2.00E+05	6.00E+05		
LEAD ARSENATE	07784409						
LEAD CHROMATE	07758976						
LIQUIFIED PETROLEUM GAS	68476857						
LITHIUM	07439932						
LITHIUM HYDRIDE	07580678						
MAGNESITE	00546930						
MAGNESIUM	07439542						
MAGNESIUM OXIDE FUME	01309484						
MALATHION	00121755						
MALEIC ANHYDRIDE	00108316						
MALEIC HYDRAZINE	00123331						
MANGANESE	07439965						
MANGANESE CYCLOPENTADIENYL TRICARBONYL	12079651						
MERCURY	07439976						
MESITYL OXIDE	00141797						
METHACRYLIC ACID	00079414						
METHANOL	00067561			3.90E+07	5.00E+08	1.00E+01	
METHAPYRILENE	00091805						
METHOMYL	16752775						
METHOXYCHLOR	00072435			3.00E+05	5.00E+06	2.00E+05	6.00E+03
METHOXYETHANOL	00109864						
METHOXYETHYL ACETATE, 2- (EGMEA)	00110496						
METHOXYPHENOL, 4-	00150765						
METHY 2-CYANOACRYLATE	00137053						
METHYL ACETATE	00079209						
METHYL ACETYLENE	00074997						
METHYL ACRYLATE	00096333						
METHYL ANILINE, N-	00100618						
METHYL CHLORIDE	00074873						
METHYL DEMETON	08022002						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
METHYL ETHYL KETONE	00078933			4.00E+07	6.00E+08	5.00E+01	####
METHYL ETHYL KETONE PEROXIDE	01338234						
METHYL FORMATE	00107313						
METHYL HYDRAZINE	00060344						
METHYL ISOAMYL KETONE	00110123						
METHYL ISOBUTYL CARBINOL	00108112			6.00E+06	8.00E+07	2.00E+05	
METHYL ISOBUTYL KETONE	00108101						
METHYL ISOCYANATE	00624839						
METHYL ISOPROPYL KETONE	00563804						
METHYL MERCAPTAN	00074931						
METHYL METHACRYLATE	00080626						
METHYL METHANESULFONATE	00066273						
METHYL N-AMYL KETONE	00110430						
METHYL PARATHION	00298000						
METHYL PROPYL KETONE	00107879						
METHYL SILICATE	00681845						
METHYL STYRENE, ALPHA-	00098839			1.00E+06	5.00E+06	2.00E+02	
METHYL TERT-BUTYL ETHER (MTBE)	01634044						
METHYLACRYLONITRILE	00126987						
METHYLAL	00109875						
METHYLAMINE	00074895			3.90E+04	1.00E+06	2.00E+03	
METHYLCHLOROPHENOXYACETIC ACID (MCPA)	00094749						
METHYLCHOLATHRENE, 3-	00056495						
METHYLCYCLOHEXANE	00108872						
METHYLCYCLOHEXANOL	25639423						
METHYLCYCLOHEXANONE, O-	00583608						
METHYLCYCLOPENTADIENYL MANGANESE TRICARBONYL, 2-	12108133						
METHYLENE BIS (2-CHLOROANILINE), 4,4'- (MOCA)	00101144						
METHYLENE BIS (4-CYCLOHEXYLISOCYANATE)	05124301						
METHYLENE BISPHENYL ISOCYANATE (MDI)	00101688						
METHYLENE DIANILINE, 4,4'-	00101779			1.00E+06		2.00E+04	5.00E+02
METHYLNAPHTHALENE, 2-	00091576						
METOLACHLOR	51218452						
METRIBUZIN	21087649						
MEVINPHOS	07786347						
MICA	12001262						
MOLYBDENUM	07439987						
MONOCHLOROBIPHENYL	27323188						
MONOCROTOPHOS	06923224						
MORPHOLINE	00110918						
NALED	00300765			6.00E+05	4.00E+06	8.00E+03	2.00E+02
NAPHTHALENE	00091203						
NAPHTHOQUINONE, 1,4-	00130154						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
NAPHTHYLAMINE, 1-	00134327						
NAPHTHYLAMINE, 2-	00091598						
NICKEL	07440020						
NICKEL CARBONYL	13463393						
NITRAPYRIN	01929824						
NITRATE-NITROGEN (TOTAL)	14797558						
NITRIC ACID	07697372						
NITRIC OXIDE	10102439						
NITRITE-NITROGEN (TOTAL)	14797650						
NITRO-O-TOLUIDINE, 5-	00099558						
NITROANILINE, M-	00099092						
NITROANILINE, O-	00088744						
NITROANILINE, P-	00100016						
NITROBENZENE	00098953						
NITROCHLOROBENZENE, P-	00100005						
NITROETHANE	00079243						
NITROGEN DIOXIDE	10102440						
NITROGEN TRIFLUORIDE	07783542						
NITROGUANIDINE	00556887						
NITROMETHANE	00075525						
NITROPHENOL, 4-	00100027			4.80E+06	6.20E+07	6.00E+03	
NITROPHENOL, O-	00088755						
NITROPROPANE, 1-	00108032						
NITROPROPANE, 2-	00079469						
NITROQUINOLINE-1-OXIDE, 4-	00056575						
NITROSODI-N-BUTYLAMINE, N-	00924163						
NITROSODI-N-PROPYLAMINE, N-	00621647						
NITROSODIETHYLAMINE, N-	00055185						
NITROSODIMETHYLAMINE, N-	00062759						
NITROSODIPHENYLAMINE, N-	00086306						
NITROSOMETHYLETHYLAMINE, N-	10595956						
NITROSOMORPHOLINE, N-	00059892						
NITROSOPIPERIDINE, N-	00100754						
NITROSOPYRROLIDINE, N-	00930552						
NITROTOLUENENE	00088722						
NITROUS OXIDE	10024972						
NONACHLOROBIPHENYL	53742077						
NONANE	00111842						
OCTACHLOROBIPHENYL	55722264						
OCTACHLORONAPHTHALENE	02234131						
OCTAHYDRO-1,3,7,5-TETRANITRO-1,3,7,5-TETRAZOCINE	02691410						
OCTYL PHTHALATE, DI-N-	00117840			1.50E+06	2.00E+07	5.00E+05	
OSMIUM TETROXIDE	20816120						
OXALIC ACID	00144627						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
OXAMYL (VYDATE)	23135220						
OXYGEN DIFLUORIDE	07783417						
OZONE	10028156						
PARAQUAT	01910425						
PARAQUAT	04685147						
PARATHION	00056382			4.70E+05	6.00E+06	1.80E+04	
PCB-1016 (AROCLOR)	12674112						
PCB-1221 (AROCLOR)	11104282						
PCB-1232 (AROCLOR)	11141165						
PCB-1242 (AROCLOR)	53469219						
PCB-1248 (AROCLOR)	12672296						
PCB-1254 (AROCLOR)	11097691						
PCB-1260 (AROCLOR)	11096825						
PENTABORANE	19624227						
PENTACHLOROBENZENE	00608935						
PENTACHLOROBIPHENYL	25429292						
PENTACHLORODIBENZO-P-DIOXINS							
PENTACHLORODIBENZOFURANS						2.00E+03	
PENTACHLOROETHANE	00076017						
PENTACHLORONAPHTHALENE	01321648						
PENTACHLORONITROBENZENE	00082688						
PENTACHLOROPHENOL	00087865			4.00E+04	5.00E+04	2.00E+05	4.00E+03
PENTAERYTHRITOL	00115775						
PENTANE	00109660						
PERCHLOROMETHYL MERCAPTAN	00594423						
PERCHLORYL FLUORIDE	07616946						
PERFLUOROISOBUTYLENE	00382218						
PERLITE	93763703						
PHENACETIN	00062442						
PHENANTHRENE	00085018			2.00E+05		8.00E+04	2.00E+03
PHENOL	00108952			4.00E+07	6.00E+08	4.00E+05	5.00E+00
PHENOTHIAZINE	00092842						
PHENYL ETHER	00101848						
PHENYL GLYCIDYL ETHER	00122601						
PHENYL MERCAPTAN	00108985						
PHENYLENEDIAMINE, M-	00108452						
PHENYLENEDIAMINE, O-	00095545						
PHENYLENEDIAMINE, P-	00106503						
PHENYLHYDRAZINE	00100630						
PHENYLPHOSPHENE	00638211						
PHORATE	00298022						
PHOSGENE	00075445						
PHOSPHINE	07803512						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
SELENIUM HEXAFLUORIDE	07783791						
SESONE	00136787						
SILICA CRYSTALLINE CRISTOBALITE	14464461						
SILICA FUME	69012642						
SILICA FUSED	60676860						
SILICON	07440213						
SILICON CARBIDE	00409212						
SILICON TETRAHYDRIDE	07803625						
SILVER	07440224						
SIMAZINE	00122349						
SODIUM	07440235						
SODIUM AZIDE	26628228						
SODIUM BISULFITE	07631905						
SODIUM FLUOROACETATE	00062748						
SODIUM HYDROXIDE	01310732						
SODIUM METABISULFITE	07681574						
STIBINE	07803523						
STRONTIUM	07440246						
STRONTIUM CHROMATE	07789062						
STRYCHNINE	00057249			1.00E+07	4.00E+08	1.00E+04	
STYRENE	00100425						
SUBTILLISINS	01395217						
SULFIDE	18496258						
SULFOTEP	03689245						
SULFPROFOS	35400432						
SULFUR DIOXIDE	07446095						
SULFUR HEXAFLUORIDE	02551624						
SULFUR MONOCHLORIDE	10025679						
SULFUR PENTAFLUORIDE	05714227						
SULFUR TETRAFLUORIDE	07783600						
SULFURIC ACID	07664939						
SULFURYL FLUORIDE	02699798						
TANTALUM	07440257						
TANTALUM OXIDE	01314610						
TEBUTHIURON	34014181						
TELLURIUM	13494809						
TELLURIUM HEXAFLUORIDE	07783804						
TEMEPHOS	03383968						
TEPP	00107493						
TERBACIL	05902512						
TERBUFOS	13071799						
TERPHENYLS	26140603						
TETRACHLORO-1,2-DIFLUOROETHANE, 1,1,2,2-	00076120						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
TRICHLORONAPHTHALENE	01321659						
TRICHLOROPHENOL, 2,4,5-	00095954						
TRICHLOROPHENOL, 2,4,6-	00088062						
TRICHLOROPHENOXYACETIC ACID, 2,4,5- (2,4,5-T)	00093765			6.00E+05	8.00E+06	3.00E+03	6.00E+01
TRICHLOROPHENOXYPROPIONIC ACID, 2,4,5- (2,4,5-TP)	00093721			4.70E+05	6.00E+06	5.00E+03	
TRICHLOROPROPANE, 1,2,3-	00096184						
TRIDYMITE	15468323						
TRIETHYLAMINE	00121448						
TRIETHYLPHOSPHOROTHIOATE, O,O,O-	00126681						
TRIFLUOROBROMOMETHANE	00075638			6.00E+05	7.50E+06	4.00E+04	
TRIFLURALIN	01582098						
TRIMETALLIC ANHYDRIDE	00552307						
TRIMETHYL BENZENE	25551137						
TRIMETHYL PHOSPHITE	00121459						
TRIMETHYLAMINE	00075503						
TRINITROBENZENE, 1,3,5-	00099354						
TRINITROGLYCEROL	00055630						
TRINITROTOLUENE, 2,4,6-	00118967						
TRIORTHOCRESYL PHOSPHATE	00078308						
TRIPHENYL AMINE	00603349						
TRIPHENYL PHOSPHATE	00115866						
TRIPOLITE	01317959						
TUNGSTEN	07440337						
TURPENTINE	08006642						
URANIUM	07440611						
VALERALDEHYDE, N-	00110623						
VANADIUM	07440622						
VANADIUM PENTOXIDE	01314621						
VINYL ACETATE	00108054						
VINYL BROMIDE	00593602			2.00E+03	3.00E+03	1.00E+04	
VINYL CHLORIDE	00075014						
VINYL CYCLOHEXENE DIOXIDE	00106876						
VINYL CYCLOHEXENE, 4-	00100403						
VINYL TOLUENE	25013154						
WARFARIN	00081812						
XYLENE,ALPHA, ALPHA'-DIAMINE-M-	01477550			1.00E+06	4.00E+09	5.00E+03	
XYLENES (TOTAL) [4]	01330207						
XYLIDINE	01300738						
YTTRIUM	07440655						
ZINC	07440666						
ZINC CHLORIDE FUME	07646857						
ZINC CHROMATE	13530659						
ZINC OXIDE DUST	01314132						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
TETRACHLORO-2,2-DIFLUOROETHANE, 1,1,1,2-	00076119						
TETRACHLOROBENZENE, 1,2,4,5-	00095943						
TETRACHLOROBIPHENYL	02051629						
TETRACHLORODIBENZO-P-DIOXIN, 2,3,7,8- (TCDD)	01746016			3.00E-05	4.00E-05	5.00E+05	
TETRACHLORODIBENZO-P-DIOXINS							
TETRACHLORODIBENZOFURANS							
TETRACHLOROETHANE, 1,1,1,2-	00630206			2.00E+06	3.00E+07	7.00E+03	1.00E+02
TETRACHLOROETHANE, 1,1,2,2-	00079345					1.00E+03	
TETRACHLOROETHYLENE (PCE)	00127184			7.00E+05	5.20E+05	2.00E+03	6.00E+01
TETRACHLORONAPHTHALENE	01335882						
TETRACHLOROPHENOL, 2,3,4,6-	00058902						
TETRAETHYL LEAD	00078002						
TETRAHYDROFURAN	00109999					7.00E+01	
TETRAMETHYL LEAD	00075741						
TETRAMETHYL SUCCINONITRILE	03333526						
TETRANITROMETHANE	00509148						
TETRASODIUM PYROPHOSPHATE	07722885						
TETRYL	00479458						
THALLIUM	07440280						
THIOBIS, 4,4'- (6-TERT-BUTYL-M-CRESOL)	00096695						
THIOGLYCOLIC ACID	00068111						
THIONAZIN	00297972						
THIONYL CHLORIDE	07719097						
THIRAM	00137268						
TIN	07440315						
TITANIUM	07440326						
TITANIUM DIOXIDE	13463677						
TOLUENE	00108883			1.00E+07	2.00E+08	1.00E+05	5.00E+01
TOLUENE-2,4-DIISOCYANATE	00584849						
TOLUIDINE, M-	00095534						
TOLUIDINE, O-	00095534						
TOLUIDINE, P-	00106490						
TOXAPHENE	08001352			4.00E+03	5.00E+03	2.00E+04	4.00E+02
TRIBROMOMETHANE (BROMOFORM)	00075252						
TRIBUTYL PHOSPHATE	00126738						
TRICHLORO-1,2,2-TRIFLUOROETHANE1,1,2-	00076131						
TRICHLOROACETIC ACID	00076039						
TRICHLOROACETONITRILE	00545062						
TRICHLOROBENZENE, 1,2,4-	00120821			8.00E+05	1.00E+07	2.00E+04	
TRICHLOROBENZENE, 1,3,5-	00180703						
TRICHLOROBIPHENYL	02051618						
TRICHLOROETHANE, 1,1,1-	00071556			7.00E+06	9.00E+07	2.00E+04	3.00E+01
TRICHLOROETHANE, 1,1,2-	00079005			3.00E+05	4.00E+06	8.00E+02	2.00E+01
TRICHLOROETHYLENE (TCE)	00079016			4.00E+05	5.20E+05	2.00E+03	4.00E+01

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
TRICHLORONAPHTHALENE	01321659						
TRICHLOROPHENOL, 2,4,5-	00095954						
TRICHLOROPHENOL, 2,4,6-	00088062						
TRICHLOROPHENOXYACETIC ACID, 2,4,5- (2,4,5-T)	00093765			6.00E+05	8.00E+06	3.00E+03	6.00E+01
TRICHLOROPHENOXYPROPIONIC ACID, 2,4,5- (2,4,5-TP)	00093721			4.70E+05	6.00E+06	5.00E+03	
TRICHLOROPROPANE, 1,2,3-	00096184						
TRIDYMITE	15468323						
TRIETHYLAMINE	00121448						
TRIETHYLPHOSPHOROTHIOATE, O,O,O-	00126681						
TRIFLUOROBROMOMETHANE	00075638			6.00E+05	7.50E+06	4.00E+04	
TRIFLURALIN	01582098						
TRIMETALLIC ANHYDRIDE	00552307						
TRIMETHYL BENZENE	25551137						
TRIMETHYL PHOSPHITE	00121459						
TRIMETHYLAMINE	00075503						
TRINITROBENZENE, 1,3,5-	00099354						
TRINITROGLYCEROL	00055630						
TRINITROTOLUENE, 2,4,6-	00118967						
TRIORTHOCRESYL PHOSPHATE	00078308						
TRIPHENYL AMINE	00603349						
TRIPHENYL PHOSPHATE	00115866						
TRIPOLITE	01317959						
TUNGSTEN	07440337						
TURPENTINE	08006642						
URANIUM	07440611						
VALERALDEHYDE, N-	00110623						
VANADIUM	07440622						
VANADIUM PENTOXIDE	01314621						
VINYL ACETATE	00108054						
VINYL BROMIDE	00593602			2.00E+03	3.00E+03	1.00E+04	
VINYL CHLORIDE	00075014						
VINYL CYCLOHEXENE DIOXIDE	00106876						
VINYL CYCLOHEXENE, 4-	00100403						
VINYL TOLUENE	25013154						
WARFARIN	00081812						
XYLENE,ALPHA, ALPHA'-DIAMINE-M-	01477550			1.00E+08	4.00E+09	5.00E+03	
XYLENES (TOTAL) [4]	01330207						
XYLIDINE	01300738						
YTTRIUM	07440655						
ZINC	07440666						
ZINC CHLORIDE FUME	07646857						
ZINC CHROMATE	13530659						
ZINC OXIDE DUST	01314132						

APPENDIX B2: STATEWIDE HUMAN HEALTH STANDARDS FOR SOILS
(ug/kg unless otherwise specified)

SUBSTANCE	CAS	INHALATION [1]		INGESTION		SOIL TO GROUNDWATER PATHWAY	CLEAN FILL
		RESIDENTIAL	NON-RESIDENTIAL	RESIDENTIAL	NON-RESIDENTIAL		
ZINC OXIDE FUME	01314132						
ZIRCONIUM	07440677						

[1] - Statewide Health Standard parameters dealing with inhalation risk will be considered by the Cleanup Standards Scientific Advisory Board in conjunction with EQB rulemakings.

[2] - The standards for lead, although not included in the original Cleanup Standards for Contaminated Soils, are taken from the former DER Lead Policy dated August 31, 1994.

EPA Region III
Preliminary Remediation Goals

EPA Region III Risk-Based Concentrations: R.L. Smith (01/31/95)

Sources: I=IRIS H=HEAST A=HEAST alternate W=Withdrawn from IRIS or HEAST E=EPA-ECAO Regional Support provisional value O=Other EPA documents.

Basis: C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration.

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg·d/mg	CPSi kg·d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels-Transfers from Soil to: Air mg/kg	Groundwater mg/kg
Acephate	30560191	4.00E-03 I		8.70E-03 I			7.7 C	0.72 C	0.36 C	660 C	73 C		
Acetaldehyde	75070		2.57E-03 I		7.70E-03 I		94 N	0.81 C					
Acetochlor	34256821	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Acetone	67641	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N	62000 E	8 E
Acetone cyanohydrin	75865	7.00E-02 H	4.00E-02 A				2600 N	150 N	95 N	140000 N	5500 N		
Acetonitrile	75078	6.00E-03 I	1.43E-02 A				220 N	52 N	8.1 N	12000 N	470 N		
Acetophenone	98862	1.00E-01 I	5.71E-06 W			X	0.042 N	0.021 N	140 N	200000 N	7800 N		
Acifluorfen	62476599	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Acrolein	107028	2.00E-02 H	5.71E-06 I				730 N	0.021 N	27 N	41000 N	1600 N		
Acrylamide	79061	2.00E-04 I		4.50E+00 I	4.55E+00 I		0.015 C	0.0014 C	0.0007 C	1.3 C	0.14 C		
Acrylic acid	79107	5.00E-01 I	1.00E-03 I				18000 N	3.7 N	680 N	1E+06 N	39000 N		
Acrylonitrile	107131	1.00E-03 H	5.71E-04 I	5.40E-01 I	2.38E-01 I		0.12 C	0.026 C	0.0058 C	11 C	1.2 C		
Alachlor	15972608	1.00E-02 I		8.00E-02 H			0.84 C	0.078 C	0.039 C	72 C	8 C		
Alar	1596845	1.50E-01 I					5500 N	550 N	200 N	310000 N	12000 N		
Aldicarb	116063	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N	570 S	0.036 H
Aldicarb sulfone	1646884	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Aldrin	309002	3.00E-05 I		1.70E+01 I	1.71E+01 I		0.004 C	0.00037 C	0.00019 C	0.34 C	0.038 C	0.5 E	0.005 E
Ally	74223646	2.50E-01 I					9100 N	910 N	340 N	510000 N	20000 N		
Allyl alcohol	107186	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Allyl chloride	107051	5.00E-02 W	2.86E-04 I				1800 N	1 N	68 N	100000 N	3900 N		
Aluminum	7429905	1.00E+00 E					37000 N	3700 N	1400 N	1E+06 N	78000 N		
Aluminum phosphide	20859738	4.00E-04 I					15 N	1.5 N	0.54 N	820 N	31 N		
Amdro	67485294	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N		
Ametryn	834128	9.00E-03 I					330 N	33 N	12 N	18000 N	700 N		
m-Aminophenol	591275	7.00E-02 H					2600 N	260 N	95 N	140000 N	5500 N		
4-Aminopyridine	504245	2.00E-05 H					0.73 N	0.073 N	0.027 N	41 N	1.6 N		
Amitraz	33089611	2.50E-03 I					91 N	9.1 N	3.4 N	5100 N	200 N		
Ammonia	7664417		2.86E-02 I				1000 N	100 N					
Ammonium sulfamate	7773060	2.00E-01 I					7300 N	730 N	270 N	410000 N	16000 N		
Aniline	62533		2.86E-04 I	5.70E-03 I			10 N	1 N	0.55 C	1000 C	110 C	45 N	0.031 N
Antimony and compounds	7440360	4.00E-04 I					15 N	1.5 N	0.54 N	820 N	31 N		
Antimony pentoxide	1314609	5.00E-04 H					18 N	1.8 N	0.68 N	1000 N	39 N		
Antimony potassium tartrate	304610	9.00E-04 H					33 N	3.3 N	1.2 N	1800 N	70 N		
Antimony tetroxide	1332316	4.00E-04 H					15 N	1.5 N	0.54 N	820 N	31 N		
Antimony trioxide	1309644	4.00E-04 H					15 N	1.5 N	0.54 N	820 N	31 N		
Apollo	74115245	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Aramite	140578	5.00E-02 H		2.50E-02 I	2.49E-02 I		2.7 C	0.25 C	0.13 C	230 C	26 C		
Arsenic	7440382	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N	380 E	15 E
Arsenic (as carcinogen)	7440382			1.75E+00 I	1.51E+01 I		0.038 C	0.00041 C	0.0018 C	3.3 C	0.37 C	380 E	15 E
Arsine	7784421		1.43E-05 I				0.52 N	0.052 N					
	76578148	9.00E-03 I					330 N	33 N	12 N	18000 N	700 N		

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg·d/mg	CPSi kg·d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels-Transfers from Soil to: Air mg/kg	Soil Screening Levels-Transfers from Soil to: Groundwater mg/kg
Atrazine	1912249	3.50E-02 I		2.22E-01 H			0.3 C	0.028 C	0.014 C	26 C	2.9 C		
Avermectin B1	65195553	4.00E-04 I					15 N	1.5 N	0.54 N	820 N	31 N		
Azobenzene	103333			1.10E-01 I	1.08E-01 I		0.61 C	0.058 C	0.029 C	52 C	5.8 C		
Barium and compounds	7440393	7.00E-02 I	1.43E-04 A				2600 N	0.52 N	95 N	140000 N	5500 N	350000 E	32 E
Baygon	114261	4.00E-03 I					150 N	15 N	5.4 N	8200 N	310 N		
Bayleton	43121433	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
Baythroid	68359375	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Benefin	1861401	3.00E-01 I					11000 N	1100 N	410 N	610000 N	23000 N		
Benomyl	17804352	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Bentazon	25057890	2.50E-03 I					91 N	9.1 N	3.4 N	5100 N	200 N		
Benzaldehyde	100527	1.00E-01 I				☒	610 N	370 N	140 N	200000 N	7800 N		
Benzene	71432		1.71E-03 E	2.90E-02 I	2.90E-02 I	☒	0.36 C	0.22 C	0.11 C	200 C	22 C	0.5 E	0.02 E
Benzenethiol	108985	1.00E-05 H					0.37 N	0.037 N	0.014 N	20 N	0.78 N		
Benzidine	92875	3.00E-03 I		2.30E+02 I	2.35E+02 I		0.00029 C	0.00003 C	0.00001 C	0.025 C	0.0028 C	1.3 C	1.100E-06 C
Benzoic acid	65850	4.00E+00 I					150000 N	15000 N	5400 N	1E+06 N	310000 N	320 S	280 E
Benzotrichloride	98077			1.30E+01 I			0.0052 C	0.00048 C	0.00024 C	0.44 C	0.049 C	0.012 C	0.000073 C
Benzyl alcohol	100516	3.00E-01 H					11000 N	1100 N	410 N	610000 N	23000 N		
Benzyl chloride	100447			1.70E-01 I		☒	0.062 C	0.037 C	0.019 C	34 C	3.8 C	0.5 C	0.00036 C
Beryllium and compounds	7440417	5.00E-03 I		4.30E+00 I	8.40E+00 I		0.016 C	0.00075 C	0.00073 C	1.3 C	0.15 C	690 E	180 E
Bidrin	141662	1.00E-04 I					3.7 N	0.37 N	0.14 N	200 N	7.8 N		
Biphenthrin (Talstar)	82657043	1.50E-02 I					550 N	55 N	20 N	31000 N	1200 N		
1,1-Biphenyl	92524	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N	9000 S	110 N
Bis(2-chloroethyl)ether	111444			1.10E+00 I	1.16E+00 I	☒	0.0092 C	0.0054 C	0.0029 C	5.2 C	0.58 C	0.3 E	0.0003 E
Bis(2-chloroisopropyl)ether	39638329	4.00E-02 I		7.00E-02 H	3.50E-02 H	☒	0.26 C	0.18 C	0.045 C	82 C	9.1 C		
Bis(chloromethyl)ether	542881			2.20E+02 I	2.17E+02 I	☒	0.00005 C	0.00003 C	0.00001 C	0.026 C	0.0029 C	0.00004 C	1.000E-07 C
Bis(2-chloro-1-methylethyl)ether				7.00E-02 W	7.00E-02 W		0.96 C	0.089 C	0.045 C	82 C	9.1 C		
Bis(2-ethylhexyl)phthalate (DEHP)	117817	2.00E-02 I		1.40E-02 I			4.8 C	0.45 C	0.23 C	410 C	46 C	210 E	11 E
Bisphenol A	80057	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Boron (and borates)	7440428	9.00E-02 I	5.71E-03 H				3300 N	21 N	120 N	180000 N	7000 N		
Boron trifluoride	7637072		2.00E-04 H				7.3 N	0.73 N					
Bromodichloromethane	75274	2.00E-02 I		6.20E-02 I		☒	0.17 C	0.1 C	0.051 C	92 C	10 C	1800 E	0.3 E
Bromoethene	593602				1.10E-01 H	☒	0.096 C	0.057 C					
Bromoform (tribromomethane)	75252	2.00E-02 I		7.90E-03 I	3.85E-03 I	☒	2.4 C	1.6 C	0.4 C	720 C	81 C	46 E	0.5 E
Bromomethane	74839	1.40E-03 I	1.43E-03 I			☒	8.7 N	5.2 N	1.9 N	2900 N	110 N	2 E	0.1 E
4-Bromophenyl phenyl ether	101553	5.80E-02 O					2100 N	210 N	78 N	120000 N	4500 N		
Bromophos	2104963	5.00E-03 H					180 N	18 N	6.8 N	10000 N	390 N		
Bromoxynil	1689845	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Bromoxynil octanoate	1689992	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
1,3-Butadiene	106990				9.80E-01 I	☒	0.011 C	0.0064 C				0.0013 C	0.000072 C
	71363	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N	9700 E	8 E
								270 N		410000 N	16000 N	530 E	68 E

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sec-Butylbenzene	135988	1.00E-02 E				☒	61 N	37 N	14 N	20000 N	780 N	80 S	0.27 N
tert-Butylbenzene	104518	1.00E-02 E				☒	61 N	37 N	14 N	20000 N	780 N		
Butylphthalyl butylglycolate	85701	1.00E+00 I					37000 N	3700 N	1400 N	1E+06 N	78000 N		
Cacodylic acid	75605	3.00E-03 H					110 N	11 N	4.1 N	6100 N	230 N		
Cadmium and compounds	7440439	5.00E-04 I			6.30E+00 I		18 N	0.00099 C	0.68 N	1000 N	39 N	920 E	6 E
Caprolactam	105602	5.00E-01 I					18000 N	1800 N	680 N	1E+06 N	39000 N		
Captafol	2425061	2.00E-03 I		8.60E-03 H			7.8 C	0.73 C	0.37 C	670 C	74 C		
Captan	133062	1.30E-01 I		3.50E-03 H			19 C	1.8 C	0.9 C	1600 C	180 C		
Carbaryl	63252	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N	0.34 S	23 N
Carbofuran	1563662	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Carbon disulfide	75150	1.00E-01 I	2.86E-03 H			☒	21 N	10 N	140 N	200000 N	7800 N	11 E	14 E
Carbon tetrachloride	56235	7.00E-04 I	5.71E-04 E	1.30E-01 I	5.25E-02 I	☒	0.16 C	0.12 C	0.024 C	44 C	4.9 C	0.2 E	0.03 E
Carbosulfan	55285148	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Carboxin	5234684	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Chloral	75876	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Chloramben	133904	1.50E-02 I					550 N	55 N	20 N	31000 N	1200 N		
Chloranil	118752			4.03E-01 H			0.17 C	0.016 C	0.0078 C	14 C	1.6 C		
Chlordane	57749	6.00E-05 I		1.30E+00 I	1.29E+00 I		0.052 C	0.0049 C	0.0024 C	4.4 C	0.49 C	10 E	2 E
Chlorimuron-ethyl	90982324	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Chlorine	7782505	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Chlorine dioxide	10049044		5.71E-05 I				2.1 N	0.21 N					
Chloroacetaldehyde	107200	6.90E-03 O					250 N	25 N	9.3 N	14000 N	540 N		
Chloroacetic acid	79118	2.00E-03 H					73 N	7.3 N	2.7 N	4100 N	160 N		
2-Chloroacetophenone	532274		8.57E-06 I				0.31 N	0.031 N					
4-Chloroaniline	106478	4.00E-03 I					150 N	15 N	5.4 N	8200 N	310 N	1200 S	0.3 E
Chlorobenzene	108907	2.00E-02 I	5.71E-03 A			☒	39 N	21 N	27 N	41000 N	1600 N	94 E	0.6 E
Chlorobenzilate	510156	2.00E-02 I		2.70E-01 H	2.70E-01 H		0.25 C	0.023 C	0.012 C	21 C	2.4 C		
p-Chlorobenzoic acid	74113	2.00E-01 H					7300 N	730 N	270 N	410000 N	16000 N		
4-Chlorobenzotrifluoride	98566	2.00E-02 H					730 N	73 N	27 N	41000 N	1600 N	86 N	7.5 N
2-Chloro-1,3-butadiene	126998	2.00E-02 A	2.00E-03 H			☒	14 N	7.3 N	27 N	41000 N	1600 N		
1-Chlorobutane	109693	4.00E-01 H				☒	2400 N	1500 N	540 N	820000 N	31000 N		
Chlorodibromomethane	124481	2.00E-02 I		8.40E-02 I		☒	0.13 C	0.075 C	0.038 C	68 C	7.6 C	1900 E	0.2 E
Chlorodifluoromethane	75456		1.43E+01 I			☒	87000 N	52000 N					
Chloroethane	75003	4.00E-01 E	2.86E+00 I			☒	8600 N	10000 N	540 N	820000 N	31000 N	2600 S	33 N
2-Chloroethyl vinyl ether	110758	2.50E-02 O				☒	150 N	91 N	34 N	51000 N	2000 N		
Chloroform	67663	1.00E-02 I		6.10E-03 I	8.05E-02 I	☒	0.15 C	0.078 C	0.52 C	940 C	100 C	0.2 E	0.3 E
Chloromethane	74873			1.30E-02 H	6.30E-03 H	☒	1.4 C	0.99 C	0.24 C	440 C	49 C	0.063 C	0.0066 C
4-Chloro-2,2-methylaniline hydrochloride	3165933			4.60E-01 H			0.15 C	0.014 C	0.0069 C	12 C	1.4 C		
4-Chloro-2-methylaniline	95692			5.80E-01 H			0.12 C	0.011 C	0.0054 C	9.9 C	1.1 C		
beta-Chloronaphthalene	91587	8.00E-02 I					2900 N	290 N	110 N	160000 N	6300 N	2.8 S	140 N
o-Chloronitrobenzene	88733			2.50E-02 H		☒	0.42 C	0.25 C	0.13 C	230 C	26 C		
				1.80E-02 H		☒	0.59 C	0.35 C	0.18 C	320 C	35 C		

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2-Chlorophenol	95578	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N	53000 E	2 E
2-Chloropropane	75296		2.86E-02 H				170 N	100 N				22 N	0.64 N
Chlorothalonil	1897456	1.50E-02 I		1.10E-02 H			6.1 C	0.57 C	0.29 C	520 C	58 C		
o-Chlorotoluene	95498	2.00E-02 I					120 N	73 N	27 N	41000 N	1600 N	1200 N	5.6 N
Chlorpropham	101213	2.00E-01 I					7300 N	730 N	270 N	410000 N	16000 N		
Chlorpyrifos	2921882	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N		
Chlorpyrifos-methyl	5598130	1.00E-02 H					370 N	37 N	14 N	20000 N	780 N		
Chlorsulfuron	64902723	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Chlorthiophos	60238564	8.00E-04 H					29 N	2.9 N	1.1 N	1600 N	63 N		
Chromium III and compounds	16065831	1.00E+00 I	5.71E-07 W				37000 N	0.0021 N	1400 N	1E+06 N	78000 N		
Chromium VI and compounds	7440473	5.00E-03 I			4.20E+01 I		180 N	0.00015 C	6.8 N	10000 N	390 N	140 E	19 E
Coal tar	8001589				2.20E+00 W			0.0028 C					
Cobalt	7440484	6.00E-02 E					2200 N	220 N	81 N	120000 N	4700 N		
Coke Oven Emissions	8007452				2.17E+00 I			0.0029 C					
Copper and compounds	7440508	3.71E-02 H					1400 N	140 N	50 N	76000 N	2900 N		
Crotonaldehyde	123739	1.00E-02 W		1.90E+00 H	1.90E+00 W		0.035 C	0.0033 C	0.0017 C	3 C	0.34 C		
Cumene	98828	4.00E-02 I	2.57E-03 H				1500 N	9.4 N	54 N	82000 N	3100 N	81 N	65 N
Cyanides:													
Barium cyanide	542621	1.00E-01 W					3700 N	370 N	140 N	200000 N	7800 N		
Calcium cyanide	592018	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N		
Copper cyanide	544923	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Cyanazine	21725462	2.00E-03 H		8.40E-01 H			0.08 C	0.0075 C	0.0038 C	6.8 C	0.76 C		
Cyanogen	460195	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N		
Cyanogen bromide	506683	9.00E-02 I					3300 N	330 N	120 N	180000 N	7000 N		
Cyanogen chloride	506774	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Free cyanide	57125	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Hydrogen cyanide	74908	2.00E-02 I	8.57E-04 I				730 N	3.1 N	27 N	41000 N	1600 N		
Potassium cyanide	151508	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Potassium silver cyanide	506616	2.00E-01 I					7300 N	730 N	270 N	410000 N	16000 N		
Silver cyanide	506649	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Sodium cyanide	143339	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N		
Zinc cyanide	557211	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Cyclohexanone	108941	5.00E+00 I					30000 N	18000 N	6800 N	1E+06 N	390000 N		
Cyclohexlamine	108918	2.00E-01 I					7300 N	730 N	270 N	410000 N	16000 N		
Cyhalothrin/Karate	68085858	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Cypermethrin	52315078	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Cyromazine	66215278	7.50E-03 I					270 N	27 N	10 N	15000 N	590 N		
Dacthal	1861321	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Dalapon	75990	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
Dimitol	39515418	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
									0.013 C	24 C	2.7 C	37 S	0.7 E

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DDT	50293	5.00E-04 I		3.40E-01 I	3.40E-01 I	☒	0.2 C	0.018 C	0.0093 C	17 C	1.9 C	80 E	1 E
Decabromodiphenyl ether	1163195	1.00E-02 I					61 N	37 N	14 N	20000 N	780 N		
Demeton	8065483	4.00E-05 I					1.5 N	0.15 N	0.054 N	82 N	3.1 N		
Diallate	2303164			6.10E-02 H		☒	0.17 C	0.1 C	0.052 C	94 C	10 C		
Diazinon	333415	9.00E-04 H					33 N	3.3 N	1.2 N	1800 N	70 N	5400 S	2.8 N
Dibenzofuran	132649	4.00E-03 E					150 N	15 N	5.4 N	8200 N	310 N	120 S	120 N
1,4-Dibromobenzene	106376	1.00E-02 I				☒	61 N	37 N	14 N	20000 N	780 N		
1,2-Dibromo-3-chloropropane	96128		5.71E-05 I	1.40E+00 H	2.42E-03 H	☒	0.048 C	0.21 N	0.0023 C	4.1 C	0.46 C	1.9 N	0.00061 M
1,2-Dibromoethane	106934		5.71E-05 H	8.50E+01 I	7.70E-01 I	☒	0.00075 C	0.0081 C	0.00004 C	0.067 C	0.0075 C	0.0058 C	0.00018 M
Dibutyl phthalate	84742	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N	100 E	120 E
Dicamba	1918009	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
1,2-Dichlorobenzene	95501	9.00E-02 I	4.00E-02 A			☒	270 N	150 N	120 N	180000 N	7000 N	300 E	6 E
1,3-Dichlorobenzene	541731	8.90E-02 O				☒	540 N	320 N	120 N	180000 N	7000 N		
1,4-Dichlorobenzene	106467		2.29E-01 I	2.40E-02 H		☒	0.44 C	0.26 C	0.13 C	240 C	27 C	7700 E	1 E
3,3'-Dichlorobenzidine	91941			4.50E-01 I			0.15 C	0.014 C	0.007 C	13 C	1.4 C	52 S	0.01 E
1,4-Dichloro-2-butene	764410				9.30E+00 H	☒	0.0011 C	0.00067 C					
Dichlorodifluoromethane	75718	2.00E-01 I	5.71E-02 A			☒	390 N	210 N	270 N	410000 N	16000 N	37 N	7.5 N
1,1-Dichloroethane	75343	1.00E-01 H	1.43E-01 A			☒	810 N	520 N	140 N	200000 N	7800 N	980 E	11 E
1,2-Dichloroethane (EDC)	107062		2.86E-03 E	9.10E-02 I	9.10E-02 I	☒	0.12 C	0.069 C	0.035 C	63 C	7 C	0.3 E	0.01 E
1,1-Dichloroethylene	75354	9.00E-03 I		6.00E-01 I	1.75E-01 I	☒	0.044 C	0.036 C	0.0053 C	9.5 C	1.1 C	0.04 E	0.03 E
1,2-Dichloroethylene (cis)	156592	1.00E-02 H				☒	61 N	37 N	14 N	20000 N	780 N	1500 E	0.2 E
1,2-Dichloroethylene (trans)	156605	2.00E-02 I				☒	120 N	73 N	27 N	41000 N	1600 N	3600 E	0.3 E
1,2-Dichloroethylene (mixture)	540590	9.00E-03 H				☒	55 N	33 N	12 N	18000 N	700 N		
2,4-Dichlorophenol	120832	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N	4800 S	0.5 E
2,4-Dichlorophenoxyacetic Acid (2,4-D)	94757	1.00E-02 I				☒	61 N	37 N	14 N	20000 N	780 N	7000 S	1.7 M
4-(2,4-Dichlorophenoxy)butyric Acid	94826	8.00E-03 I					290 N	29 N	11 N	16000 N	630 N		
1,2-Dichloropropane	78875		1.14E-03 I	6.80E-02 H		☒	0.16 C	0.092 C	0.046 C	84 C	9.4 C	11 E	0.02 E
2,3-Dichloropropanol	616239	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N		
1,3-Dichloropropene	542756	3.00E-04 I	5.71E-03 I	1.75E-01 H	1.30E-01 H	☒	0.077 C	0.048 C	0.018 C	33 C	3.7 C	0.1 E	0.001 E
Dichlorvos	62737	5.00e-04 I	1.43E-04 I	2.90E-01 I			0.23 C	0.022 C	0.011 C	20 C	2.2 C	3.5 C	0.00072 C
Dicofol	115322			4.40E-01 W			0.15 C	0.014 C	0.0072 C	13 C	1.5 C		
Dicyclopentadiene	77736	3.00E-02 H	5.71E-05 A			☒	0.42 N	0.21 N	41 N	61000 N	2300 N		
Dieldrin	60571	5.00E-05 I		1.60E+01 I	1.61E+01 I		0.0042 C	0.00039 C	0.0002 C	0.36 C	0.04 C	2 E	0.001 E
Diesel emissions			1.43E-03 I				52 N	5.2 N					
Diethyl phthalate	84662	8.00E-01 I					29000 N	2900 N	1100 N	1E+06 N	63000 N	520 E	110 E
Diethylene glycol, monobutyl ether	112345		5.71E-03 H				210 N	21 N					
Diethylene glycol, monoethyl ether	111900	2.00E+00 H					73000 N	7300 N	2700 N	1E+06 N	160000 N		
Diethylforamide	617845	1.10E-02 H					400 N	40 N	15 N	22000 N	860 N		
Di(2-ethylhexyl)adipate	103231	6.00E-01 I		1.20E-03 I			56 C	5.2 C	2.6 C	4800 C	530 C		
Diethylstilbestrol	56531			4.70E+03 H			0.00001 C	1E-06 C	7E-07 C	0.0012 C	0.00014 C		
Difenzoquat (Avenge)	43222486	8.00E-02 I					2900 N	290 N	110 N	160000 N	6300 N		
Diflubenzuron	35367385	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		

EPA Region III Risk-Based Concentrations: R.L. Smith (01/31/95)

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg d/mg	CPSi kg d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels-Transfers from Soil to: Air mg/kg	Groundwater mg/kg
1,1-Difluoroethane	75376		1.14E+01 I			☒	69000 N	42000 N					
Diisopropyl methylphosphonate (DIMP)	1445756	8.00E-02 I					2900 N	290 N	110 N	160000 N	6300 N		
Dimethipin	55290647	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Dimethoate	60515	2.00E-04 I					7.3 N	0.73 N	0.27 N	410 N	16 N		
3,3'-Dimethoxybenzidine	119904			1.40E-02 H			4.8 C	0.45 C	0.23 C	410 C	46 C		
Dimethylamine	124403		5.71E-06 W				0.21 N	0.021 N					
2,4-Dimethylaniline hydrochloride	21436964			5.80E-01 H			0.12 C	0.011 C	0.0054 C	9.9 C	1.1 C		
2,4-Dimethylaniline	95681			7.50E-01 H			0.09 C	0.0083 C	0.0042 C	7.6 C	0.85 C		
N-N-Dimethylaniline	121697	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
3,3'-Dimethylbenzidine	119937			9.20E+00 H			0.0073 C	0.00068 C	0.00034 C	0.62 C	0.069 C	29 C	0.00039 C
N,N-Dimethylformamide	68122	1.00E-01 H	8.57E-03 I				3700 N	31 N	140 N	200000 N	7800 N		
1,1-Dimethylhydrazine	57147			2.60E+00 W	3.50E+00 W		0.026 C	0.0018 C	0.0012 C	2.2 C	0.25 C		
1,2-Dimethylhydrazine	540738			3.70E+01 W	3.70E+01 W		0.0018 C	0.00017 C	0.00009 C	0.15 C	0.017 C		
2,4-Dimethylphenol	105679	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N	5400 S	3 E
2,6-Dimethylphenol	576261	6.00E-04 I					22 N	2.2 N	0.81 N	1200 N	47 N		
3,4-Dimethylphenol	95658	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Dimethyl phthalate	131113	1.00E+01 H					370000 N	37000 N	14000 N	1E+06 N	780000 N	1600 E	1200 E
Dimethyl terephthalate	120616	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
1,2-Dinitrobenzene	528290	4.00E-04 H					15 N	1.5 N	0.54 N	820 N	31 N		
1,3-Dinitrobenzene	99650	1.00E-04 I					3.7 N	0.37 N	0.14 N	200 N	7.8 N		
1,4-Dinitrobenzene	100254	4.00E-04 H					15 N	1.5 N	0.54 N	820 N	31 N		
4,6-Dinitro-o-cyclohexyl phenol	131895	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
2,4-Dinitrophenol	51285	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N	360 N	0.1 E
Dinitrotoluene mixture				6.80E-01 I			0.099 C	0.0092 C	0.0046 C	8.4 C	0.94 C		
2,4-Dinitrotoluene	121142	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N	120 S	0.2 E
2,6-Dinitrotoluene	606202	1.00E-03 H					37 N	3.7 N	1.4 N	2000 N	78 N	370 S	0.1 E
Dinoseb	88857	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
di-n-Octyl phthalate	117840	2.00E-02 H					730 N	73 N	27 N	41000 N	1600 N	1000000 S	1000000 E
1,4-Dioxane	123911			1.10E-02 I			6.1 C	0.57 C	0.29 C	520 C	58 C		
Diphenamid	957517	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
Diphenylamine	122394	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
1,2-Diphenylhydrazine	122667			8.00E-01 I	7.70E-01 I		0.084 C	0.0081 C	0.0039 C	7.2 C	0.8 C		
Diquat	85007	2.20E-03 I					80 N	8 N	3 N	4500 N	170 N		
Direct black 38	1937377			8.60E+00 H			0.0078 C	0.00073 C	0.00037 C	0.67 C	0.074 C		
Direct blue 6	2602462			8.10E+00 H			0.0083 C	0.00077 C	0.00039 C	0.71 C	0.079 C		
Direct brown 95	16071866			9.30E+00 H			0.0072 C	0.00067 C	0.00034 C	0.62 C	0.069 C		
Disulfoton	298044	4.00E-05 I					1.5 N	0.15 N	0.054 N	82 N	3.1 N		
1,4-Dithiane	505293	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Diuron	330541	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
							150 N	15 N	5.4 N	8200 N	310 N		

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Endrin	72208	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N	16 S	0.4 E
Epichlorohydrin	106898	2.00E-03 H	2.86E-04 I	9.90E-03 I	4.20E-03 I		6.8 C	1 N	0.32 C	580 C	65 C		
1,2-Epoxybutane	106887		5.71E-03 I				210 N	21 N					
Ethephon (2-chloroethyl phosphonic acid)	16672870	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Ethion	563122	5.00E-04 I					18 N	1.8 N	0.68 N	1000 N	39 N		
2-Ethoxyethanol acetate	111159	3.00E-01 A					11000 N	1100 N	410 N	610000 N	23000 N		
2-Ethoxyethanol	110805	4.00E-01 H	5.71E-02 I				15000 N	210 N	540 N	820000 N	31000 N		
Ethyl acrylate	140885			4.80E-02 H			1.4 C	0.13 C	0.066 C	120 C	13 C		
EPTC (S-Ethyl dipropylthiocarbamate)	759944	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Ethyl ether	60297	2.00E-01 I				X	1200 N	730 N	270 N	410000 N	16000 N		
Ethyl methacrylate	97632	9.00E-02 H					3300 N	330 N	120 N	180000 N	7000 N		
Ethyl acetate	141786	9.00E-01 I					33000 N	3300 N	1200 N	1E+06 N	70000 N		
Ethylbenzene	100414	1.00E-01 I	2.86E-01 I			X	1300 N	1000 N	140 N	200000 N	7800 N	260 E	5 E
Ethylene cyanohydrin	109784	3.00E-01 H					11000 N	1100 N	410 N	610000 N	23000 N		
Ethylene diamine	107153	2.00E-02 H					730 N	73 N	27 N	41000 N	1600 N		
Ethylene glycol	107211	2.00E+00 I					73000 N	7300 N	2700 N	1E+06 N	160000 N		
Ethylene glycol, monobutyl ether	111762		5.71E-03 H				210 N	21 N					
Ethylene oxide	75218			1.02E+00 H	3.50E-01 H		0.066 C	0.018 C	0.0031 C	5.6 C	0.63 C		
Ethylene thiourea (ETU)	96457	8.00E-05 I		1.19E-01 H			0.57 C	0.053 C	0.027 C	48 C	5.4 C		
Ethyl p-nitrophenyl phenylphosphorothioate	2104645	1.00E-05 I					0.37 N	0.037 N	0.014 N	20 N	0.78 N		
Ethylnitrosourea	759739			1.40E+02 W			0.00048 C	0.00005 C	0.00002 C	0.041 C	0.0046 C		
Ethylphthalyl ethyl glycolate	84720	3.00E+00 I					110000 N	11000 N	4100 N	1E+06 N	230000 N		
Express	10120	8.00E-03 I					290 N	29 N	11 N	16000 N	630 N		
Fenamiphos	22224926	2.50E-04 I					9.1 N	0.91 N	0.34 N	510 N	20 N		
Fluometuron	2164172	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Fluoride	7782414	6.00E-02 I					2200 N	220 N	81 N	120000 N	4700 N		
Fluoridone	59756604	8.00E-02 I					2900 N	290 N	110 N	160000 N	6300 N		
Flurprimidol	56425913	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Flutolanil	66332965	6.00E-02 I					2200 N	220 N	81 N	120000 N	4700 N		
Fluvalinate	69409945	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Folpet	133073	1.00E-01 I		3.50E-03 I			19 C	1.8 C	0.9 C	1600 C	180 C		
Fomesafen	72178020			1.90E-01 I			0.35 C	0.033 C	0.017 C	30 C	3.4 C		
Fonofos	944229	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Formaldehyde	50000	2.00E-01 I			4.55E-02 I		7300 N	0.14 C	270 N	410000 N	16000 N		
Formic Acid	64186	2.00E+00 H					73000 N	7300 N	2700 N	1E+06 N	160000 N		
Fosetyl-al	39148248	3.00E+00 I					110000 N	11000 N	4100 N	1E+06 N	230000 N		
Furan	110009	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Furazolidone	67458			3.80E+00 H			0.018 C	0.0016 C	0.00083 C	1.5 C	0.17 C		
Furfural	98011	3.00E-03 I	1.43E-02 A				110 N	52 N	4.1 N	6100 N	230 N		
Furium	531828			5.00E+01 H			0.0013 C	0.00013 C	0.00006 C	0.11 C	0.013 C		
Furmecyclox	60568050			3.00E-02 I			2.2 C	0.21 C	0.11 C	190 C	21 C		

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Glycidaldehyde	765344	4.00E-04 I	2.86E-04 H				15 N	1 N	0.54 N	820 N	31 N		
Glyphosate	1071836	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Haloxyfop-methyl	69806402	5.00E-05 I					1.8 N	0.18 N	0.068 N	100 N	3.9 N		
Harmony	79277273	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
HCH (alpha)	319846			6.30E+00 I	6.30E+00 I		0.011 C	0.00099 C	0.0005 C	0.91 C	0.1 C	0.9 E	0.0004 E
HCH (beta)	319857			1.80E+00 I	1.80E+00 I		0.037 C	0.0035 C	0.0018 C	3.2 C	0.35 C	16 E	0.002 E
HCH (gamma) Lindane	58899	3.00E-04 I		1.30E+00 H			0.052 C	0.0048 C	0.0024 C	4.4 C	0.49 C	4.2 C	0.006 E
HCH-technical	608731			1.80E+00 I	1.79E+00 I		0.037 C	0.0035 C	0.0018 C	3.2 C	0.35 C		
Heptachlor	76448	5.00E-04 I		4.50E+00 I	4.55E+00 I	☒	0.0023 C	0.0014 C	0.0007 C	1.3 C	0.14 C	0.3 E	0.06 E
Heptachlor epoxide	1024573	1.30E-05 I		9.10E+00 I	9.10E+00 I	☒	0.0012 C	0.00069 C	0.00035 C	0.63 C	0.07 C	1 E	0.03 E
Hexabromobenzene	87821	2.00E-03 I				☒	12 N	7.3 N	2.7 N	4100 N	160 N		
Hexachlorobenzene	118741	8.00E-04 I		1.60E+00 I	1.61E+00 I	☒	0.0066 C	0.0039 C	0.002 C	3.6 C	0.4 C	1 E	0.8 E
Hexachlorobutadiene	87683	2.00E-04 H		7.80E-02 I	7.70E-02 I	☒	0.14 C	0.081 C	0.04 C	73 C	8.2 C	1 E	0.1 E
Hexachlorocyclopentadiene	77474	7.00E-03 I	2.00E-05 H			☒	0.15 N	0.073 N	9.5 N	14000 N	550 N	2 E	10 E
Hexachlorodibenzo-p-dioxin mixture	19408743			6.20E+03 I	4.55E+03 I		0.00001 C	1E-06 C	5E-07 C	0.0009 C	0.0001 C		
Hexachloroethane	67721	1.00E-03 I		1.40E-02 I	1.40E-02 I	☒	0.75 C	0.45 C	0.23 C	410 C	46 C	49 E	0.2 E
Hexachlorophene	70304	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N		
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121824	3.00E-03 I		1.10E-01 I			0.61 C	0.057 C	0.029 C	52 C	5.8 C		
1,6-Hexamethylene diisocyanate	822060		2.86E-06 I				0.1 N	0.01 N					
n-Hexane	110543	6.00E-02 H	5.71E-02 I			☒	350 N	210 N	81 N	120000 N	4700 N	32 N	13 N
Hexazinone	51235042	3.30E-02 I					1200 N	120 N	45 N	67000 N	2600 N		
Hydrazine, hydrazine sulfate	302012			3.00E+00 I	1.71E+01 I		0.022 C	0.00037 C	0.0011 C	1.9 C	0.21 C		
Hydrogen chloride	7647010		2.00E-03 I				73 N	7.3 N					
Hydrogen sulfide	7783064	3.00E-03 I	2.57E-04 I				110 N	0.94 N	4.1 N	6100 N	230 N		
Hydroquinone	123319	4.00E-02 H					1500 N	150 N	54 N	82000 N	3100 N		
Imazalil	35554440	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Imazaquin	81335377	2.50E-01 I					9100 N	910 N	340 N	510000 N	20000 N		
Iprodione	36734197	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N		
Isobutanol	78831	3.00E-01 I				☒	1800 N	1100 N	410 N	610000 N	23000 N		
Isophorone	78591	2.00E-01 I		9.50E-04 I			71 C	6.6 C	3.3 C	6000 C	670 C	3400 E	0.2 E
Isopropalin	33820530	1.50E-02 I					550 N	55 N	20 N	31000 N	1200 N		
Isopropyl methyl phosphonic acid	1832548	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Isoxaben	82558507	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Kepone	143500			1.80E+01 E			0.0037 C	0.00035 C	0.00018 C	0.32 C	0.035 C		
Lactofen	77501634	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Linuron	330552	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Lithium	7439932	2.00E-02 E					730 N	73 N	27 N	41000 N	1600 N		
Londax	83056996	2.00E-01 I					7300 N	730 N	270 N	410000 N	16000 N		
Malathion	121755	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Maleic anhydride	108316	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg-d/mg	CPSi kg-d/mg	VOC	Risk-Based Concentrations: Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion: Industrial mg/kg	Soil Ingestion: Residential mg/kg	Soil Screening Levels-Transfers from Soil to: Air mg/kg	Groundwater mg/kg
Mancozeb	8018017	3.00E-02 H					1100 N	110 N	41 N	61000 N	2300 N		
Maneb	12427382	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Manganese and compounds	7439965	5.00E-03 I	1.43e-05 I				180 N	0.052 N	6.8 N	10000 N	390 N		
Mephosfolan	950107	9.00E-05 H					3.3 N	0.33 N	0.12 N	180 N	7 N		
Mepiquat chloride	24307264	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
Mercury (inorganic)	7439976	3.00E-04 H	8.57E-05 H				11 N	0.31 N	0.41 N	610 N	23 N	7 E	3 E
Mercury (methyl)	22967926	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N		
Merphos	150505	3.00E-05 I					1.1 N	0.11 N	0.041 N	61 N	2.3 N		
Merphos oxide	78488	3.00E-05 I					1.1 N	0.11 N	0.041 N	61 N	2.3 N		
Metalaxyl	57837191	6.00E-02 I					2200 N	220 N	81 N	120000 N	4700 N		
Methacrylonitrile	126987	1.00E-04 I	2.00E-04 A				3.7 N	0.73 N	0.14 N	200 N	7.8 N		
Methamidophos	10265926	5.00E-05 I					1.8 N	0.18 N	0.068 N	100 N	3.9 N		
Methanol	67561	5.00E-01 I					18000 N	1800 N	680 N	1E+06 N	39000 N		
Methidathion	950378	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Methomyl	16752775	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Methoxychlor	72435	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N	41 S	62 E
2-Methoxyethanol acetate	110496	2.00E-03 A					73 N	7.3 N	2.7 N	4100 N	160 N		
2-Methoxyethanol	109864	1.00E-03 H	5.71E-03 I				37 N	21 N	1.4 N	2000 N	78 N		
2-Methoxy-5-nitroaniline	99592			4.60E-02 H			1.5 C	0.14 C	0.069 C	120 C	14 C		
Methyl acetate	79209	1.00E+00 H					37000 N	3700 N	1400 N	1E+06 N	78000 N		
Methyl acrylate	96333	3.00E-02 A					1100 N	110 N	41 N	61000 N	2300 N		
2-Methylaniline hydrochloride	636215			1.80E-01 H			0.37 C	0.035 C	0.018 C	32 C	3.5 C		
2-Methylaniline	95534			2.40E-01 H			0.28 C	0.026 C	0.013 C	24 C	2.7 C		
Methyl chlorocarbonate	79221	1.00E+00 W					37000 N	3700 N	1400 N	1E+06 N	78000 N		
4-(2-Methyl-4-chlorophenoxy) butyric acid	94815	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
2-Methyl-4-chlorophenoxyacetic acid	94746	5.00E-04 I					18 N	1.8 N	0.68 N	1000 N	39 N		
2-(2-Methyl-14-chlorophenoxy)propionic aci	93652	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Methylcyclohexane	108872		8.57E-01 H				31000 N	3100 N				60 S	1500 N
Methylene bromide	74953	1.00E-02 A				X	61 N	37 N	14 N	20000 N	780 N		
Methylene chloride	75092	6.00E-02 I	8.57E-01 H	7.50E-03 I	1.64E-03 I	X	4.1 C	3.8 C	0.42 C	760 C	85 C	7 E	0.01 E
4,4'-Methylene bis(2-chloroaniline)	101144	7.00E-04 H		1.30E-01 H	1.30E-01 H		0.52 C	0.048 C	0.024 C	44 C	4.9 C		
4,4'-Methylenebisbenzeneamine	101779			2.50E-01 W			0.27 C	0.025 C	0.013 C	23 C	2.6 C		
4,4'-Methylene bis(N,N'-dimethyl)aniline	101611			4.60E-02 I			1.5 C	0.14 C	0.069 C	120 C	14 C		
4,4'-Methylenediphenyl isocyanate	101688		5.71E-06 I			X	0.035 N	0.021 N					
Methyl ethyl ketone	78933	6.00E-01 I	2.86E-01 I			X	1900 N	1000 N	810 N	1E+06 N	47000 N		
Methyl hydrazine	60344			1.10E+00 W			0.061 C	0.0057 C	0.0029 C	5.2 C	0.58 C		
Methyl isobutyl ketone	108101	8.00E-02 H	2.29E-02 A				2900 N	84 N	110 N	160000 N	6300 N		
Methyl methacrylate	80626	8.00E-02 H					2900 N	290 N	110 N	160000 N	6300 N		
2-Methyl-5-nitroaniline	99558			3.30E-02 H			2 C	0.19 C	0.096 C	170 C	19 C		
Methyl parathion	298000	2.50E-04 I					9.1 N	0.91 N	0.34 N	510 N	20 N	28 S	0.041 N
2-Methylphenol (o-cresol)	95487	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N	12000 S	6 E
[illegible]	103394	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		

EPA Region III Risk-Based Concentrations: R.L. Smith (01/31/95)

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4-Methylphenol (p-cresol)	106445	5.00E-03 H					180 N	18 N	6.8 N	10000 N	390 N		
Methyl styrene (mixture)	25013154	6.00E-03 A	1.14E-02 A			☒	60 N	42 N	8.1 N	12000 N	470 N		
Methyl styrene (alpha)	98839	7.00E-02 A				☒	430 N	260 N	95 N	140000 N	5500 N	8.8 S	7.5 N
Methyl tertbutyl ether (MTBE)	1634044	5.00E-03 E	8.57E-01 I			☒	180 N	3100 N	6.8 N	10000 N	390 N		
Metolaclor (Dual)	51218452	1.50E-01 H					5500 N	550 N	200 N	310000 N	12000 N		
Metribuzin	21807649	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Mirex	2385855	2.00E-04 I		1.80E+00 W			0.037 C	0.0035 C	0.0018 C	3.2 C	0.35 C		
Molinate	2212671	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Molybdenum	7439987	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Monochloramine	10599903	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Naled	300765	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
2-Naphthylamine	91598			1.30e+02 E			0.00052 C	0.00005 C	0.00002 C	0.044 C	0.0049 C		
Napropamide	15299997	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
Nickel refinery dust					8.40E-01 I			0.0075 C					
Nickel and compounds	7440020	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N	6900 E	21 E
Nickel subsulfide	12035722				1.70E+00 I			0.0037 C					
Nitrapyrin	1929824	1.50E-03 W					55 N	5.5 N	2 N	3100 N	120 N		
Nitrate	14797558	1.60E+00 I					58000 N	5800 N	2200 N	1E+06 N	130000 N		
Nitric Oxide	10102439	1.00E-01 W					3700 N	370 N	140 N	200000 N	7800 N		
Nitrite	14797650	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
2-Nitroaniline	88744	6.00E-05 W	5.71E-05 H				2.2 N	0.21 N	0.081 N	120 N	4.7 N		
3-Nitroaniline	99092	3.00E-03 O					110 N	11 N	4.1 N	6100 N	230 N		
4-Nitroaniline	100016	3.00E-03 O					110 N	11 N	4.1 N	6100 N	230 N		
Nitrobenzene	98953	5.00E-04 I	5.71E-04 A			☒	3.4 N	2.1 N	0.68 N	1000 N	39 N	110 E	0.09 E
Nitrofurantoin	67209	7.00E-02 H					2600 N	260 N	95 N	140000 N	5500 N		
Nitrofurazone	59870			1.50E+00 H	9.40E+00 H		0.045 C	0.00067 C	0.0021 C	3.8 C	0.43 C		
Nitrogen dioxide	10102440	1.00E+00 W					37000 N	3700 N	1400 N	1E+06 N	78000 N		
Nitroguanidine	556887	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N		
4-Nitrophenol	100027	6.20E-02 O					2300 N	230 N	84 N	130000 N	4800 N		
2-Nitropropane	79469		5.71E-03 I		9.40E+00 H		210 N	0.00067 C					
N-Nitrosodi-n-butylamine	924163			5.40E+00 I	5.60E+00 I		0.012 C	0.0011 C	0.00058 C	1.1 C	0.12 C		
N-Nitrosodiethanolamine	1116547			2.80E+00 I			0.024 C	0.0022 C	0.0011 C	2 C	0.23 C		
N-Nitrosodiethylamine	55185			1.50E+02 I	1.51E+02 I		0.00045 C	0.00004 C	0.00002 C	0.038 C	0.0043 C		
N-Nitrosodimethylamine	62759			5.10E+01 I	4.90E+01 I		0.0013 C	0.00013 C	0.00006 C	0.11 C	0.013 C		
N-Nitrosodiphenylamine	86306			4.90E-03 I			14 C	1.3 C	0.64 C	1200 C	130 C	29 C	0.2 E
N-Nitroso di-n-propylamine	621647			7.00E+00 I			0.0096 C	0.00089 C	0.00045 C	0.82 C	0.091 C	0.014 C	0.00002 E
N-Nitroso-N-methylethylamine	10595956			2.20E+01 I			0.0031 C	0.00028 C	0.00014 C	0.26 C	0.029 C		
N-Nitrosopyrrolidine	930552			2.10E+00 I	2.13E+00 I		0.032 C	0.0029 C	0.0015 C	2.7 C	0.3 C		
m-Nitrotoluene	99081	1.00E-02 H				☒	61 N	37 N	14 N	20000 N	780 N	460 S	0.42 N
	88722	1.00E-02 H				☒	61 N	37 N	14 N	20000 N	780 N	460 S	0.42 N

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NuStar	85509199	7.00E-04 I					26 N	2.6 N	0.95 N	1400 N	55 N		
Octabromodiphenyl ether	32536520	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N		
Octahydro-1357-tetranitro-1357-tetrazocine	2691410	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Octamethylpyrophosphoramide	152169	2.00E-03 H					73 N	7.3 N	2.7 N	4100 N	160 N		
Oryzalin	19044883	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Oxadiazon	19666309	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Oxamyl	23135220	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Oxyfluorfen	42874033	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N		
Paclobutrazol	76738620	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Paraquat	1910425	4.50E-03 I					160 N	16 N	6.1 N	9200 N	350 N		
Parathion	56382	6.00E-03 H					220 N	22 N	8.1 N	12000 N	470 N	110 S	3.9 N
Pebulate	1114712	5.00E-02 H					1800 N	180 N	68 N	100000 N	3900 N		
Pendimethalin	40487421	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N		
Pentabromo-6-chloro cyclohexane	87843			2.30E-02 H			2.9 C	0.27 C	0.14 C	250 C	28 C		
Pentabromodiphenyl ether	32534819	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Pentachlorobenzene	608935	8.00E-04 I				X	4.9 N	2.9 N	1.1 N	1600 N	63 N	570 N	48 N
Pentachloronitrobenzene	82688	3.00E-03 I		2.60E-01 H		X	0.041 C	0.024 C	0.012 C	22 C	2.5 C		
Pentachlorophenol	87865	3.00E-02 I		1.20E-01 I			0.56 C	0.052 C	0.026 C	48 C	5.3 C	7.9 C	0.2 E
Permethrin	52645531	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		
Phenmedipham	13684634	2.50E-01 I					9100 N	910 N	340 N	510000 N	20000 N		
Phenol	108952	6.00E-01 I					22000 N	2200 N	810 N	1E+06 N	47000 N	21000 S	49 E
m-Phenylenediamine	108452	6.00E-03 I					220 N	22 N	8.1 N	12000 N	470 N		
p-Phenylenediamine	106503	1.90E-01 H					6900 N	690 N	260 N	390000 N	15000 N		
Phenylmercuric acetate	62384	8.00E-05 I					2.9 N	0.29 N	0.11 N	160 N	6.3 N		
2-Phenylphenol	90437			1.94E-03 H			35 C	3.2 C	1.6 C	3000 C	330 C		
Phorate	298022	2.00E-04 H					7.3 N	0.73 N	0.27 N	410 N	16 N		
Phosmet	732116	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Phosphine	7803512	3.00E-04 I	8.57E-06 H				11 N	0.031 N	0.41 N	610 N	23 N		
Phosphorus (white)	7723140	2.00E-05 I					0.73 N	0.073 N	0.027 N	41 N	1.6 N		
p-Phthalic acid	100210	1.00E+00 H					37000 N	3700 N	1400 N	1E+06 N	78000 N		
Phthalic anhydride	85449	2.00E+00 I	3.43E-02 H				73000 N	130 N	2700 N	1E+06 N	160000 N		
Picloram	1918021	7.00E-02 I					2600 N	260 N	95 N	140000 N	5500 N		
Pirimiphos-methyl	29232937	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
Polybrominated biphenyls		7.00E-06 H		8.90E+00 H			0.0076 C	0.0007 C	0.00035 C	0.64 C	0.072 C		
Polychlorinated biphenyls (PCBs)	1336363			7.70E+00 I			0.0087 C	0.00081 C	0.00041 C	0.74 C	0.083 C		8.2 E
Aroclor 1016	12674112	7.00E-05 I					2.6 N	0.26 N	0.095 N	140 N	5.5 N		
Aroclor 1254	11097691	2.00E-05 I					0.73 N	0.073 N	0.027 N	41 N	1.6 N		
Polychlorinated terphenyls (PCTs)				4.50E+00 E			0.015 C	0.0014 C	0.0007 C	1.3 C	0.14 C		
Polynuclear aromatic hydrocarbons													
Acenaphthene	83329	6.00E-02 I					2200 N	220 N	81 N	120000 N	4700 N	120 S	200 E
Anthracene	120127	3.00E-01 I					11000 N	1100 N	410 N	610000 N	23000 N	6.8 S	4300 E
				7.30E-01 E	6.10E-01 E		0.092 C	0.01 C	0.0043 C	7.8 C	0.88 C	27 S	0.7 E

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Benzo[b]fluoranthene	205992			7.30E-01 E	6.10E-01 E		0.092 C	0.01 C	0.0043 C	7.8 C	0.88 C	23 S	4 E
Benzo[k]fluoranthene	207089			7.30E-02 E	6.10E-02 E		0.92 C	0.1 C	0.043 C	78 C	8.8 C		4 E
Benzo[a]pyrene	50328			7.30E+00 I	6.10E+00 W		0.0092 C	0.001 C	0.00043 C	0.78 C	0.088 C	11 S	4 E
Carbazole	86748			2.00E-02 H			3.4 C	0.31 C	0.16 C	290 C	32 C	11 S	0.5 E
Chrysene	218019			7.30E-03 E	6.10E-03 E		9.2 C	1 C	0.43 C	780 C	88 C	3.6 S	1 E
Dibenz[ah]anthracene	53703			7.30E+00 E	6.10E+00 E		0.0092 C	0.001 C	0.00043 C	0.78 C	0.088 C	7.2 S	11 E
Fluoranthene	206440	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N	68 S	980 E
Fluorene	86737	4.00E-02 I					1500 N	150 N	54 N	82000 N	3100 N	89 S	160 E
Indeno[1,2,3-cd]pyrene	193395			7.30E-01 E	6.10E-01 E		0.092 C	0.01 C	0.0043 C	7.8 C	0.88 C	280 S	35 E
Naphthalene	91203	4.00E-02 W					1500 N	150 N	54 N	82000 N	3100 N	180 S	30 E
Pyrene	129000	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N	56 S	1400 E
Prochloraz	67747095	9.00E-03 I		1.50E-01 I			0.45 C	0.042 C	0.021 C	38 C	4.3 C		
Profluralin	26399360	6.00E-03 H					220 N	22 N	8.1 N	12000 N	470 N		
Prometon	1610180	1.50E-02 I					550 N	55 N	20 N	31000 N	1200 N		
Prometryn	7287196	4.00E-03 I					150 N	15 N	5.4 N	8200 N	310 N		
Pronamide	23950585	7.50E-02 I					2700 N	270 N	100 N	150000 N	5900 N		
Propachlor	1918167	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Propanil	709988	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Propargite	2312358	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Propargyl alcohol	107197	2.00E-03 I					73 N	7.3 N	2.7 N	4100 N	160 N		
Propazine	139402	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Propham	122429	2.00E-02 I					730 N	73 N	27 N	41000 N	1600 N		
Propiconazole	60207901	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Propylene glycol	57556	2.00E+01 H					730000 N	73000 N	27000 N	1E+06 N	1000000 N		
Propylene glycol, monoethyl ether	52125538	7.00E-01 H					26000 N	2600 N	950 N	1E+06 N	55000 N		
Propylene glycol, monomethyl ether	107982	7.00E-01 H	5.71E-01 I				26000 N	2100 N	950 N	1E+06 N	55000 N		
Propylene oxide	75569		8.57E-03 I	2.40E-01 I	1.29E-02 I		0.28 C	0.49 C	0.013 C	24 C	2.7 C		
Pursuit	81335775	2.50E-01 I					9100 N	910 N	340 N	510000 N	20000 N		
Pydrin	51630581	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Pyridine	110861	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Quinalphos	13593038	5.00E-04 I					18 N	1.8 N	0.68 N	1000 N	39 N		
Quinoline	91225			1.20E+01 H			0.0056 C	0.00052 C	0.00026 C	0.48 C	0.053 C		
Resmethrin	10463868	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
Ronnel	299843	5.00E-02 H					1800 N	180 N	68 N	100000 N	3900 N		
Rotenone	83794	4.00E-03 I					150 N	15 N	5.4 N	8200 N	310 N		
Savey	78587050	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Selenious Acid	7783008	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Selenium	7782492	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		3 E
Selenourea	630104	5.00E-03 H					180 N	18 N	6.8 N	10000 N	390 N		
[illegible]	[illegible]	[illegible]					3300 N	330 N	120 N	180000 N	7000 N		

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Sodium azide	26628228	4.00E-03 I					150 N	15 N	5.4 N	8200 N	310 N		
Sodium diethyldithiocarbamate	148185	3.00E-02 I		2.70E-01 H			0.25 C	0.023 C	0.012 C	21 C	2.4 C		
Sodium fluoroacetate	62748	2.00E-05 I					0.73 N	0.073 N	0.027 N	41 N	1.6 N		
Sodium metavanadate	13718268	1.00E-03 H					37 N	3.7 N	1.4 N	2000 N	78 N		
Strontium, stable	7440246	6.00E-01 I					22000 N	2200 N	810 N	1E+06 N	47000 N		
Strychnine	57249	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N		
Styrene	100425	2.00E-01 I	2.86E-01 I			☒	1600 N	1000 N	270 N	410000 N	16000 N	1400 E	2 E
Systhane	88671890	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
2,3,7,8-TCDD (dioxin)	1746016			1.56E+05 H	1.16E+05 H		4E-07 C	5E-08 C	C	4E-05 C	4E-06 C		
Tebuthiuron	34014181	7.00E-02 I					2600 N	260 N	95 N	140000 N	5500 N		
Temephos	3383968	2.00E-02 H					730 N	73 N	27 N	41000 N	1600 N		
Terbacil	5902512	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Terbufos	13071799	2.50E-05 H					0.91 N	0.091 N	0.034 N	51 N	2 N		
Terbutryn	886500	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
1,2,4,5-Tetrachlorobenzene	95943	3.00E-04 I				☒	1.8 N	1.1 N	0.41 N	610 N	23 N	91 N	0.69 N
1,1,1,2-Tetrachloroethane	630206	3.00E-02 I		2.60E-02 I	2.59E-02 I	☒	0.41 C	0.24 C	0.12 C	220 C	25 C		
1,1,2,2-Tetrachloroethane	79345			2.00E-01 I	2.03E-01 I	☒	0.052 C	0.031 C	0.016 C	29 C	3.2 C	0.4 E	0.001 E
Tetrachloroethylene (PCE)	127184	1.00E-02 I		5.20E-02 E	2.03E-03 E	☒	1.1 C	3.1 C	0.061 C	110 C	12 C	11 E	0.04 E
2,3,4,6-Tetrachlorophenol	58902	3.00E-02 I					1100 N	110 N	41 N	61000 N	2300 N		
p,a,a,a-Tetrachlorotoluene	5216251			2.00E+01 H		☒	0.00053 C	0.00031 C	0.00016 C	0.29 C	0.032 C		
Tetrachlorovinphos	961115	3.00E-02 I		2.40E-02 H			2.8 C	0.26 C	0.13 C	240 C	27 C		
Tetraethyldithiopyrophosphate	3689245	5.00E-04 I					18 N	1.8 N	0.68 N	1000 N	39 N		
Lead (tetraethyl)	78002	1.00E-07 I					0.0037 N	0.00037 N	0.00014 N	0.2 N	0.0078 N	0.00068 N	0.000034 N
Thallic oxide	1314325	7.00E-05 W					2.6 N	0.26 N	0.095 N	140 N	5.5 N		
Thallium													0.4 E
Thallium acetate	563688	9.00E-05 I					3.3 N	0.33 N	0.12 N	180 N	7 N		
Thallium carbonate	6533739	8.00E-05 I					2.9 N	0.29 N	0.11 N	160 N	6.3 N		
Thallium chloride	7791120	8.00E-05 I					2.9 N	0.29 N	0.11 N	160 N	6.3 N		
Thallium nitrate	10102451	9.00E-05 I					3.3 N	0.33 N	0.12 N	180 N	7 N		
Thallium selenite	12039520	9.00E-05 W					3.3 N	0.33 N	0.12 N	180 N	7 N		
Thallium sulfate	7446186	8.00E-05 I					2.9 N	0.29 N	0.11 N	160 N	6.3 N		
Thiobencarb	28249776	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
2-(Thiocyanomethylthio)-benzothiazole	21564170	3.00E-02 H					1100 N	110 N	41 N	61000 N	2300 N		
Thiofanox	39196184	3.00E-04 H					11 N	1.1 N	0.41 N	610 N	23 N		
Thiophanate-methyl	23564058	8.00E-02 I					2900 N	290 N	110 N	160000 N	6300 N		
Thiram	137268	5.00E-03 I					180 N	18 N	6.8 N	10000 N	390 N		
Tin and compounds		6.00E-01 H					22000 N	2200 N	810 N	1E+06 N	47000 N		
Toluene	108883	2.00E-01 I	1.14E-01 I			☒	750 N	420 N	270 N	410000 N	16000 N	520 E	5 E
Toluene-2,4-diamine	95807			3.20E+00 H			0.021 C	0.002 C	0.00099 C	1.8 C	0.2 C		
Toluene-2,5-diamine	95705	6.00E-01 H					22000 N	2200 N	810 N	1E+06 N	47000 N		
Toluene-2,6-diamine	823405	2.00E-01 H					7300 N	730 N	270 N	410000 N	16000 N		

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Toxaphene	8001352			1.10E+00 I	1.12E+00 I		0.061 C	0.0056 C	0.0029 C	5.2 C	0.58 C	5 E	0.04 E
Tralomethrin	66841256	7.50E-03 I					270 N	27 N	10 N	15000 N	590 N		
Triallate	2303175	1.30E-02 I					470 N	47 N	18 N	27000 N	1000 N		
Triasulfuron	82097505	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
1,2,4-Tribromobenzene	615543	5.00E-03 I				X	30 N	18 N	6.8 N	10000 N	390 N		
Tributyltin oxide (TBTO)	56359	3.00E-05 I					1.1 N	0.11 N	0.041 N	61 N	2.3 N		
2,4,6-Trichloroaniline hydrochloride	33663502			2.90E-02 H			2.3 C	0.22 C	0.11 C	200 C	22 C		
2,4,6-Trichloroaniline	634935			3.40E-02 H			2 C	0.18 C	0.093 C	70 C	19 C		
1,2,4-Trichlorobenzene	120821	1.00E-02 I	5.71e-02 H			X	190 N	210 N	14 N	20000 N	780 N	240 E	2 E
1,1,1-Trichloroethane	71556	9.00E-02 W	2.86E-01 W			X	1300 N	1000 N	120 N	180000 N	7000 N	980 E	0.9 E
1,1,2-Trichloroethane	79005	4.00E-03 I		5.70E-02 I	5.60E-02 I	X	0.19 C	0.11 C	0.055 C	100 C	11 C	0.8 E	0.01 E
Trichloroethylene (TCE)	79016	6.00E-03 E		1.10E-02 W	6.00E-03 E	X	1.6 C	1 C	0.29 C	520 C	58 C	3 E	0.02 E
Trichlorofluoromethane	75694	3.00E-01 I	2.00E-01 A			X	1300 N	730 N	410 N	610000 N	23000 N	790 N	13 N
2,4,5-Trichlorophenol	95954	1.00E-01 I					3700 N	370 N	140 N	200000 N	7800 N	8200 S	120 E
2,4,6-Trichlorophenol	88062			1.10E-02 I	1.09E-02 I		6.1 C	0.57 C	0.29 C	520 C	58 C	150 C	0.05 E
2,4,5-Trichlorophenoxyacetic acid	93765	1.00E-02 I					370 N	37 N	14 N	20000 N	780 N		
2-(2,4,5-Trichlorophenoxy)propionic acid	93721	8.00E-03 I					290 N	29 N	11 N	16000 N	630 N		
1,1,2-Trichloropropane	598776	5.00E-03 I				X	30 N	18 N	6.8 N	10000 N	390 N	13 N	0.14 N
1,2,3-Trichloropropane	96184	6.00E-03 I		7.00e+00 I		X	0.0015 C	0.00089 C	0.00045 C	0.82 C	0.091 C	0.00003 C	6.000E-06 C
1,2,3-Trichloropropene	96195	5.00E-03 H				X	30 N	18 N	6.8 N	10000 N	390 N		
1,1,2-Trichloro-1,2,2- trifluoroethane	76131	3.00E+01 I	8.57E+00 H			X	59000 N	31000 N	41000 N	1E+06 N	1000000 N	2400 S	3100 N
Tridiphane	58138082	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N		
Triethylamine	121448		2.00E-03 I				73 N	7.3 N					
Trifluralin	1582098	7.50E-03 I		7.70E-03 I			8.7 C	0.81 C	0.41 C	740 C	83 C		
1,2,4-Trimethylbenzene	95636	5.00e-04 E				X	3 N	1.8 N	0.68 N	1000 N	39 N		
1,3,5-Trimethylbenzene	108678	4.00e-04 E				X	2.4 N	1.5 N	0.54 N	820 N	31 N	6.8 N	0.26 N
Trimethyl phosphate	512561			3.70E-02 H			1.8 C	0.17 C	0.085 C	150 C	17 C		
1,3,5-Trinitrobenzene	99354	5.00E-05 I					1.8 N	0.18 N	0.068 N	100 N	3.9 N		
Trinitrophenylmethylnitramine	479458	1.00E-02 H					370 N	37 N	14 N	20000 N	780 N		
2,4,6-Trinitrotoluene	118967	5.00E-04 I		3.00E-02 I			2.2 C	0.21 C	0.11 C	190 C	21 C		
Uranium (soluble salts)	7440611	3.00E-03 I					110 N	11 N	4.1 N	6100 N	230 N		
Vanadium	7440622	7.00E-03 H					260 N	26 N	9.5 N	14000 N	550 N		
Vanadium pentoxide	1314621	9.00E-03 I					330 N	33 N	12 N	18000 N	700 N		
Vanadium sulfate	36907423	2.00E-02 H					730 N	73 N	27 N	41000 N	1600 N		
Vernam	1929777	1.00E-03 I					37 N	3.7 N	1.4 N	2000 N	78 N		
Vinclozolin	50471448	2.50E-02 I					910 N	91 N	34 N	51000 N	2000 N		
Vinyl acetate	108054	1.00E+00 H	5.71E-02 I				37000 N	210 N	1400 N	1E+06 N	78000 N	370 E	84 E
Vinyl bromide	593602		8.57E-04 I			X	5.2 N	3.1 N				2 N	0.018 N
	75014			1.90E+00 H	3.00E-01 H	X	0.019 C	0.021 C	0.0017 C	3 C	0.34 C	0.002 E	0.01 E
								0.41 N		610 N	23 N		

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p-Xylene	106423	8.57E-02 W				☒	520 N	310 N				1000 S	220 N
Xylene (mixed)	1330207	2.00E+00 I				☒	12000 N	7300 N	2700 N	1E+06 N	160000 N	320 E	74 E
Zinc	7440666	3.00E-01 I					11000 N	1100 N	410 N	610000 N	23000 N		42000 E
Zinc phosphide	1314847	3.00E-04 I					11 N	1.1 N	0.41 N	610 N	23 N		
Zineb	12122677	5.00E-02 I					1800 N	180 N	68 N	100000 N	3900 N		